Oak Meadow

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Prealgebra
Teacher Manual

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Oak Meadow, Inc.
Post Office Box 615
Putney, Vermont 05346
oakmeadow.com

Table of Contents

Teacher Manual Introduction

The coursebook contains all the instructions and assignments for this full-year course, which is organized into 36 lessons that correspond to the 10 chapters in the textbook. Each lesson is designed to be completed in one week.

This teacher manual includes solutions to the math problems in the coursebook activities. Answers to the textbook exercise sets and chapter tests are found in the textbook. Students are expected to check their own answers for the exercise sets so they can get immediate feedback and correct any mistakes. Either the student or a supervising adult/teacher will be checking their answers for the chapter tests. If you would prefer to check their answers to exercise sets as well, make this expectation known.

If you have additional assessment tests you would like students to take at the end of each chapter, provide these at the beginning of the course. Students will receive reminders to complete these assessment tests (if available).

In this teacher manual, you will find the full text from the student coursebook as well as teacher manual answers, which are shown in **orange**. When a student gets a factual answer wrong, you can share the correct answer and address any underlying misconceptions. Several incorrect answers related to a particular topic or skill point to an area the student will benefit from revisiting. Students are instructed to show all their work for each solution, which will let you spot where they are having trouble.

For obvious reasons, it is best not to share this teacher manual with your student. Each student is expected to produce original work, and any incidence of plagiarism should be taken very seriously. If you notice a student's answers matching those of the teacher manual word for word, a discussion about plagiarism and the importance of doing original work is necessary.

A Note About the Workload

Oak Meadow courses are designed to be flexible. Teachers can require all assignments to be completed or designate some assignments as required and others as optional. This lets teachers adapt the course for a wide range of student abilities, goals, and skills.

Students vary greatly in terms of their ability to absorb information and communicate their ideas. Some might find the reading and exercise sets in this course take longer than expected; others might find the activities take a great deal of time. In general, students can expect to spend about five hours

on each weekly lesson. If your student needs more time to complete the work, you can modify lessons to focus on fewer assignments. Modifications like these can allow students to produce work that is of a higher quality than if they have to rush to get everything done.

Each lesson in this course can be customized to suit your student's needs. Use your judgment in skipping, substituting, and adjusting assignments as needed so that your student can meet the course's main objectives while devoting an appropriate amount of time to their studies. Keep an eye on the workload as your student progresses through the course and make adjustments so they have time for meaningful learning experiences.

Coursebook Introduction

Welcome to *Prealgebra*! This course is designed for independent learning, so hopefully you will find it easy to navigate. However, it is assumed you will have an adult (such as a parent, tutor, or school-based teacher) supervising your work and providing support and feedback. We'll refer to this person as "your teacher" throughout this course. If you have a question about your work, ask your teacher for help. Please read this entire course introduction before beginning lesson 1. This information will help you be more successful and get the most out of the course.

Course Materials

The following textbook is required for this course:

- *Prealgebra* by Elayn Martin-Gay (Pearson, 2024)

This textbook is accompanied by an online resource called MyLab Math that contains many helpful tools, such as instructional videos, chapter test prep videos, a detailed solution manual, and the digital textbook. Ask your teacher if you need help creating a MyLab Math account or accessing its many features.

Note: MyLab Math is available for individual purchase for students using the course independently.

In addition, this course uses online resources, all of which can be accessed through the Oak Meadow website at the following link:

"Curriculum Links"

oakmeadow.com/curriculum-links

Bookmark this page for easy access to all the online resources mentioned in the activities.

Course Organization

This course is organized into 36 lessons that correspond with the 10 chapters in the textbook. Each lesson is designed to be completed in one week.

When you begin each lesson, take a few minutes to look over all the assignments and activity options. This will help you plan your time accordingly. Use the assignment checklist at the beginning of each lesson to check off tasks as you complete them so you can see at a glance what you still need to do.

Lesson content is divided into different categories, as explained below:

Exercise sets, found in the textbook, help you develop necessary skills. Please work on them daily, check your answers using the answer key at the back of the textbook or the online solution manual, and correct the problems where you made mistakes. **It is essential that you review and correct any problems you answered incorrectly before moving forward in the lesson.** Otherwise, you won't know whether or not you understand the ideas in the lesson. If you are not sure how to correct a mistake, please reach out to your teacher for help.

Activities are designed to help you apply your learning in new ways and to promote critical and creative thinking. You will see opportunities to engage in open-ended critical thinking tasks, visual modeling, error analysis, analytical puzzles, financial applications, and more. You will have the opportunity to choose between multiple activities and complete the task that is most appealing to you. Whether that means investigating a concept you enjoy, challenging yourself with something outside your comfort zone, or exploring your creative side, this is the time to take ownership of the direction of your learning!

Chapter tests are found in the textbook at the end of each chapter. After completing a chapter test, either you or a supervising adult will grade it and mark the score at the top, such as 18/20. Then, review any mistakes and make necessary corrections. Additional **assessment tests** may also be provided by your school-based teacher, if you are enrolled in school.

Share Your Work provides a reminder of what to share with your teacher at the end of each lesson.

It is important that you always show your work and/or explain your thinking, wherever relevant, so your teacher can see where you are having difficulty and better support your learning.

Note: In order to be considered complete, all math assignments need to include handwritten computations showing how you arrived at your final answer.

Information About Exercise Sets

- The exercise sets listed are suggestions. More or fewer problems can be done as needed. The textbook includes answers to assigned problems in the exercise sets as well as full solutions to selected problems in the appendices in the back of the book. You can do additional problems beyond the exercises assigned for extra practice, however most even-numbered answers are not available in the textbook.

- If you have access to MyLab Math, you are strongly encouraged to check your work using the online solution manual, which has fully worked out solutions for each problem.

- Concept Extensions can be found at the end of each problem set in the textbook for additional learning and challenges. There are some optional extension problems included in the assignment list, but you are encouraged to explore as many of these problems as you wish.

Information About Activities

When submitting your work for each activity, clearly indicate which activity you have completed and include all relevant work.

Many of the activities are open-ended. This means they do not necessarily have a "right" answer or they have more than one correct solution. There could be multiple ways to approach these problems and multiple ways to answer them correctly.

Activities will be assessed according to the following criteria.

Problem-Solving and Precision	Work is clear, organized, and detailed. Appropriate symbols, labels, units, and terminology are used.
Reasoning and Explaining	Symbols, words, and diagrams are interpreted with mathematical meaning. Prior knowledge is integrated into reasoning.
Modeling and Using Tools	Models, tools, and strategies are used to simplify, explain, give structure, and/or communicate a problem-solving strategy and a solution.
Seeing Structure and Generalizing	Structures and patterns are identified and extended to make generalizations and/or connections to prior learning.

Academic Expectations

You are expected to complete your work with integrity and always submit your own original work. The appendix contains important material that you will need to read and incorporate into your work throughout the year.

A Note About the Workload

Students vary greatly in terms of their ability to absorb information and communicate their ideas. Some might find the reading and exercise sets in this course take longer than expected; others might find the activities take a great deal of time. In general, students can expect to spend about five hours on each weekly lesson.

Keep an eye on the workload as you progress through the course. If you find you are struggling to complete the work in a reasonable time frame, discuss your options with your teacher, who might modify certain lessons depending on particular learning goals or challenges you are facing.

We wish you a challenging and successful year of *Prealgebra*!

Chapter 1: Whole Numbers

ASSIGNMENT CHECKLIST

☐ Read section 1.1.

☐ Read section 1.2 and complete the selected problems.

☐ Read section 1.3 and complete the selected problems.

☐ Choose one of the following activities to complete:

Activity A: Fill in the Blank—Adding and Subtracting Whole Numbers

Activity B: Puzzle—Carrying and Borrowing

Activity C: Puzzle—Perimeter

Learning Objectives

Use the table below to track how your skills are developing over time and to identify skills that need more work as you progress through this lesson.

Skills	Notes
Identify place value in whole numbers	
Write whole numbers in words, standard form, and expanded form	
Add and subtract whole numbers	
Find the perimeter of polygons	
Draw conclusions from reading tables	

Lesson Introduction

In lesson 1, you begin your journey through prealgebra with whole numbers. You will explore place value in whole numbers and perform addition and subtraction. You will apply your learning to the geometric concept of finding the perimeter of polygons and explore the use of whole numbers in word problems and data tables. You will have the opportunity to explore these concepts through a choice of several open-ended and investigative tasks in this lesson's activities. Let's get started!

Exercise Sets

Read the following sections, and complete the accompanying problem sets. Plan to complete a portion each day. If you have online access to MyLab Math, you can watch the instructional videos as well.

As you complete each set of problems, check your answers using the answer key at the back of the textbook. Correct any problems where you made mistakes. If you need help, let your teacher know.

1. Read section 1.1, "Study Skill Tips for Success in Mathematics" (2).

2. Read section 1.2, "Place Value, Names for Numbers, and Reading Tables" (8), and then complete the following problems in Exercise Set 1.2.

   ☐ 1–15 odd

   ☐ 29–37 odd

   ☐ 47–61 odd

3. Read section 1.3, "Adding and Subtracting Whole Numbers, and Perimeter" (17), and then complete the following problems in Exercise Set 1.3.

   ☐ 1–9 odd

   ☐ 19–29 odd

   ☐ 51–63 odd

   ☐ 75, 77, 85, and 87

Activities

Choose one of the following activities to complete:

- Activity A: Fill in the Blank—Adding and Subtracting Whole Numbers

- Activity B: Puzzle—Carrying and Borrowing

- Activity C: Puzzles—Perimeter

Note: Many of the activities in this course contain reflection questions. You may choose to answer these questions in writing, as an audio recording, or as a video recording. Regardless of the method,

make sure you thoroughly explain your answers. Please consult with your teacher if you have questions about how to submit audio or video recordings.

Activities can be assessed according to the criteria in the rubric below.

Skill	Criteria	Notes
Problem-Solving and Precision	Work is clear, organized, and detailed. Appropriate symbols, labels, units, and terminology are used.	
Reasoning and Explaining	Symbols, words, and diagrams are interpreted with mathematical meaning. Prior knowledge is integrated into reasoning.	
Modeling and Using Tools	Models, tools, and strategies are used to simplify, explain, give structure, and/or communicate a problem-solving strategy and a solution.	
Seeing Structure and Generalizing	Structures and patterns are identified and extended to make generalizations and/or connections to prior learning.	

Activity A: Fill in the Blank—Adding and Subtracting Whole Numbers

Choose from the integers 0 through 9 to fill in the blue boxes in the following problem to make a true statement. You cannot use a number more than once. Include your work to verify your answer.

$$\square\,\square + \square\,\square = \square\,\square - \square\,\square$$

There are many possible solutions to this problem. Verify the student's work and check that they did not use a number more than once. Some possible solutions are shown below.

$04 + 38 = 69 - 27$

$24 + 35 = 78 - 19$

$13 + 56 = 97 - 28$

$47 + 36 = 98 - 15$

Activity B: Puzzle—Carrying and Borrowing

Fill in the missing values in the following subtraction and addition problems.

$$
\begin{array}{r}
7\ 2\ 5\ \square \\
-\ 3\ \square\ 8\ 6 \\
\hline
\square\ 9\ \square\ 3
\end{array}
\qquad
\begin{array}{r}
\square\ \square\ 6 \\
+\ 2\ 4\ \square \\
\hline
\square\ 1\ 2\ 7
\end{array}
$$

Solution:

$$
\begin{array}{r}
{}^{6}\cancel{7}\ {}^{11}\cancel{2}\ 5\ \boxed{9} \\
-\ 3\ \boxed{2}\ 8\ 6 \\
\hline
\boxed{3}\ 9\ \boxed{7}\ 3
\end{array}
\qquad
\begin{array}{r}
{}^{1}\ \boxed{8}\ \boxed{8}\ 6 \\
+\ 2\ 4\ \boxed{1} \\
\hline
\boxed{1}\ 1\ 2\ 7
\end{array}
$$

Activity C: Puzzles—Perimeter

Solve both of the following perimeter puzzles. Show all your work or include a written explanation to support your answers.

1. Draw and label three different rectangles that each have a perimeter of 24 units.

    Students should draw and label three different rectangles that each have a perimeter of 24 units. There are six rectangles with the following dimensions that meet these criteria:

    1×11

    2×10

    3×9

    4×8

    5×7

    6×6 (square)

2. The following image contains six rectangles of the same size. Each rectangle has a perimeter of 48 inches. Find the outer perimeter of the overall shape. Explain how you found your answer.
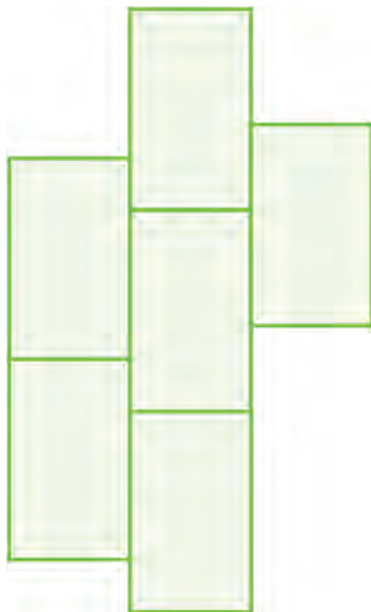
Answer: 144 inches

There are multiple ways to solve this problem. Students should describe how they arrived at their answer. Three possible methods are described below.

Method #1: Add up the perimeter of the six rectangles and remove the overlap. We can see there is an overlap of 6 total heights and 6 total bases, which leaves 3 total rectangles that need to be subtracted from the total perimeter:

6(48) – 3(48) = 144 in.

Method #2: Rearrange the rectangles so that bases and heights can be easily compared. We can highlight the exposed edges that complete each rectangle. We see there are three total rectangles with edges making up the outer perimeter:

3(48) = 144 in.
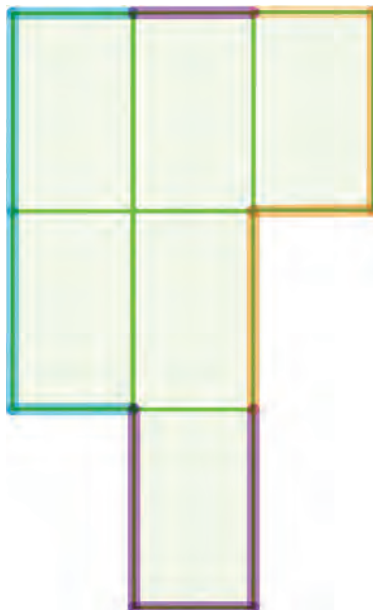
Method #3: Highlight the exposed edges to complete full rectangles. We can see that the exposed edges of the outer perimeter can compose three rectangles:

3(48) = 144 in.

SHARE YOUR WORK

When you have completed this portion of the lesson, please share the following work with your teacher.
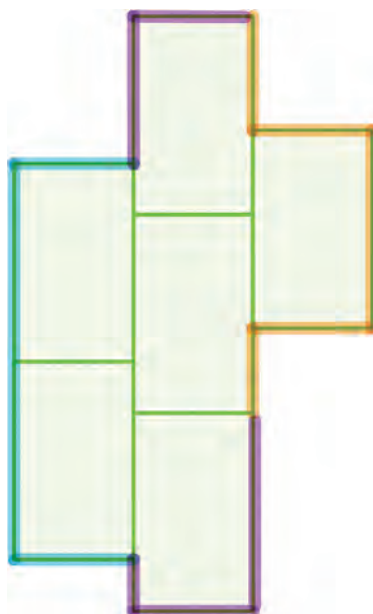
- Exercise Sets 1.2 and 1.3 (showing handwritten computations and corrections)

- Choice of activity (labeled with the title of the activity):

  - Activity A: Fill in the Blank—Adding and Subtracting Whole Numbers

  - Activity B: Puzzle—Carrying and Borrowing

  - Activity C: Puzzles—Perimeter

Make sure everything is labeled and you've included all your handwritten computations. If you have any questions about the work or how to share it, contact your teacher.

ASSIGNMENT CHECKLIST

☐ Read section 1.4 and complete the selected problems.

☐ Read section 1.5 and complete the selected problems.

☐ Choose one of the following activities to complete:

    Activity A: Puzzles—Area and Perimeter

    Activity B: Visual Models—Multiplication as Area Arrays of Partial Products

Learning Objectives

Use the table below to track how your skills are developing over time and to identify skills that need more work as you progress through this lesson.

Skills	Notes
Round whole numbers to a given place value	
Estimate sums and differences using rounding strategies	
Multiply whole numbers	
Find the area of a rectangle	
Apply multiplication and estimation to word problems	

Lesson Introduction

In lesson 2, you will continue working with whole numbers as you explore rounding strategies, estimation, and multiplication. You will apply your learning to the geometric concept of finding the area of a rectangle and explore the use of multiplication and estimation in application problems. You will have the opportunity to explore these concepts through investigative tasks or visual models in this lesson's activities.

Exercise Sets

1. Read section 1.4, "Rounding and Estimating" (32), and then complete the following problems in Exercise Set 1.4.

    ☐ 1–15 odd

    ☐ 23–29 odd

    ☐ 37–43 odd

    ☐ 53–57 odd

2. Read section 1.5, "Multiplying Whole Numbers and Area" (40), and then complete the following problems in Exercise Set 1.5.

    ☐ 1–21 odd

    ☐ 31, 39, and 41

    ☐ 45–55 odd

    ☐ 71, 79, 91, and 93

Activities

Choose one of the following activities to complete:

- Activity A: Puzzle—Area and Perimeter
- Activity B: Visual Models—Multiplication as Area Arrays of Partial Products

Note: Many of the activities in this course contain reflection questions. You may choose to answer these questions in writing, as an audio recording, or as a video recording. Regardless of the method, make sure you thoroughly explain your answers. Please consult with your teacher if you have questions about how to submit audio or video recordings.

Activities can be assessed according to the criteria in the rubric below.

Skill	Criteria	Notes
Problem-Solving and Precision	Work is clear, organized, and detailed. Appropriate symbols, labels, units, and terminology are used.	
Reasoning and Explaining	Symbols, words, and diagrams are interpreted with mathematical meaning. Prior knowledge is integrated into reasoning.	
Modeling and Using Tools	Models, tools, and strategies are used to simplify, explain, give structure, and/or communicate a problem-solving strategy and a solution.	
Seeing Structure and Generalizing	Structures and patterns are identified and extended to make generalizations and/or connections to prior learning.	

Activity A: Puzzles—Area and Perimeter

Solve both of the following area and perimeter puzzles. Show all your work or include a written explanation to support your answers.

1. Which is bigger: a square with a perimeter of 30 inches or a square with an area of 30 in.^{2}? How do you know? Show all your work to justify your answer.

   Students should compare the area of a square with a perimeter of 30 inches to a square with an area of 30 in.^{2}. They should recognize that a square with a perimeter of 30 inches has four side lengths of 30/4 inches, or 7.5 inches. Calculating the area of that square gives (7.5)(7.5) = 56.25 in.^{2}, which is larger than the square with an area of 30 in.^{2}. Students should show all their work to justify their answer and explain their reasoning.

2. Create a square whose numerical area is equal to its numerical perimeter (disregarding units). How many ways do you think this can happen? Explain your answer.

   A 4×4 square has an area of 16 and a perimeter of 16. In this case, $P = 4s$ and $A = s \times s$, which gives $P = 4(4) = 16$ and $A = 4 \times 4 = 16$. This is the only case where this will be true because no other multiplier of 4 is also itself squared, i.e., $4s = s \times s$ only when $s = 4$.

Activity B: Visual Models—Multiplication as Area Arrays of Partial Products

When we examine a multiplication problem through the lens of partial products, we can visualize the process using area models. Let's take the multiplication problem 45 × 23. When we apply the standard

algorithm, we get a product of 1,035. If we examine the partial products occurring in the multiplication process, taking into account place value, we can see that we are completing four distinct multiplication problems: 3 × 5, 3 × 40, 20 × 5, and 20 × 40.

$$
\begin{array}{r}
\overset{1}{4}5 \\
\times 23 \\
\hline
135 \\
+900 \\
\hline
1035
\end{array}
\qquad
\begin{array}{r}
45 \\
\times 23 \\
\hline
15 \\
120 \\
100 \\
+800 \\
\hline
1035
\end{array}
\qquad
\begin{array}{l}
3 \times 5 \\
3 \times 40 \\
20 \times 5 \\
20 \times 40
\end{array}
$$

If we think about this in terms of an area model, we can draw a large rectangle partitioned by place value, as you see below. Notice that across the top we have 40 + 5 = 45 and along the side we have 20 + 3 = 23. By partitioning the area by place value, we have divided the whole into four rectangles that correspond to the partial products: 20 × 40, 3 × 40, 20 × 5, and 3 × 5. If we calculate the area of each smaller rectangle and add them up, we see that the area totals 1,035, which is equivalent to the product of 45 × 23.

$$\text{Area} = 800 + 100 + 120 + 15 = 1035$$
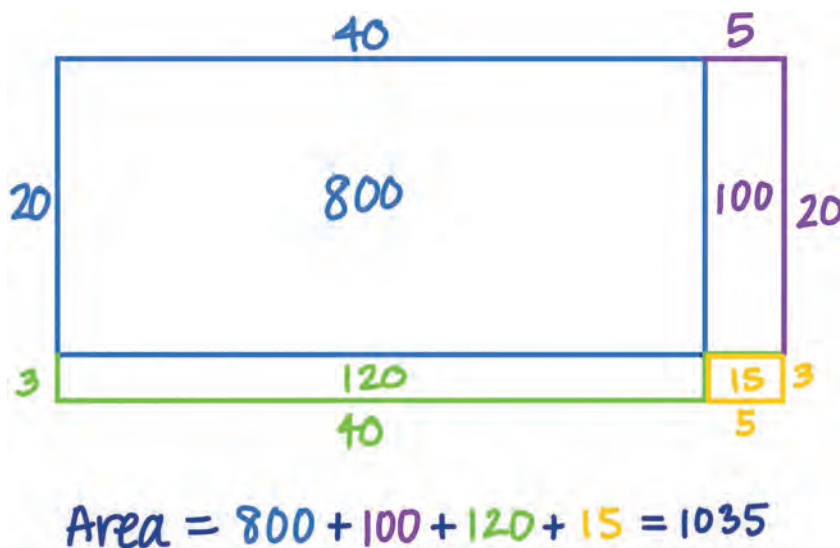
Now you try! It may be helpful to complete these questions on graph paper and with a ruler. At the following resource, you can download a printable piece of graph paper:

"Printable Graph Paper"

(All the online links in this course can be accessed at oakmeadow.com/curriculum-links. Bookmark this page for easy access to all the online resources mentioned in the activities.)

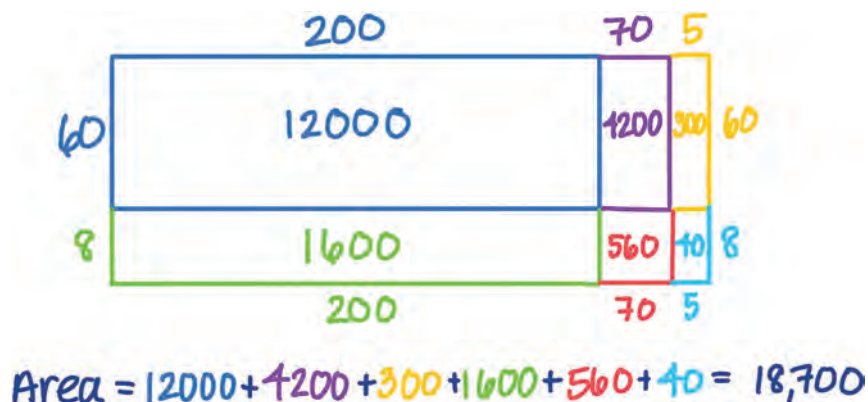Submit pictures of your visual models and computations for each question.

1. Complete the following multiplication problems using an area array.

   Students should complete area arrays for the two multiplication problems and demonstrate how the areas of each one partition by place value and produce a sum equal to the product.

   a. 56 × 34
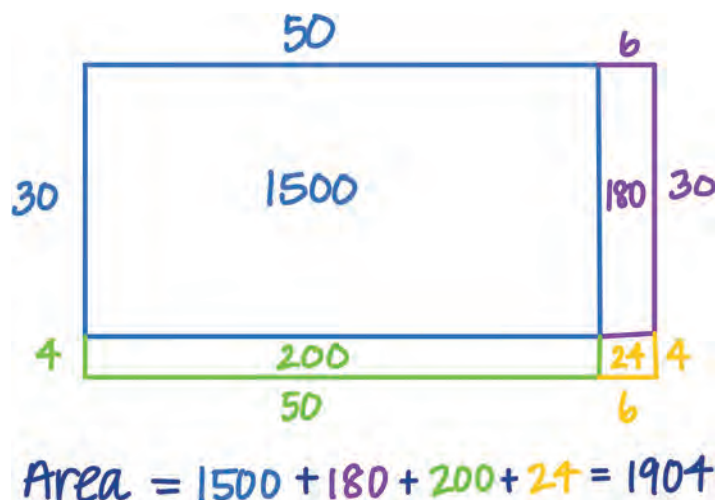
   b. 275 × 68

2. Verify your work using partial products in the standard multiplication algorithm.

   Students should verify their area arrays using partial products in the standard multiplication algorithm.

a.

$$56 \times 34$$

24	4 × 6
200	4 × 50
180	30 × 6
+ 1500	30 × 50
1904	

b.

$$275 \times 68$$

40	8 × 5
560	8 × 70
1600	8 × 200
300	60 × 5
4200	60 × 70
+ 12000	60 × 200
18,700	

SHARE YOUR WORK

When you have completed this portion of the lesson, please share the following work with your teacher.

- Exercise Sets 1.4 and 1.5 (showing handwritten computations and corrections)
- Choice of activity (labeled with the title of the activity):
  - Activity A: Puzzles—Area and Perimeter
  - Activity B: Visual Models—Multiplication as Area Arrays of Partial Products

Make sure everything is labeled and you've included all your handwritten computations. If you have any questions about the work or how to share it, contact your teacher.