

Math in Focus[®]

Singapore Math[®]
by Marshall Cavendish[®]

Program Overview

MIDDLE SCHOOL




**World-Class Singapore Math[®]
for Your Classroom**



Why Singapore Math®?

The reason is simple—Singapore students consistently demonstrate exceptional math achievement on international studies.

The way they teach and learn math in Singapore is a key factor to their success. Now, U.S. students also have the opportunity to benefit from the same approach with ***Math in Focus®: Singapore Math® by Marshall Cavendish®***, the U.S. edition of Singapore's most widely used elementary and middle school program.



**Math in
Focus®**
Singapore Math®
by Marshall Cavendish®

For online evaluation, visit **preview.hrw.com**.

1. Enter the sample word: **NLMIF68** and click **Next**.
2. Enter your Contact Information and click **Register**.
3. Confirm that your Contact Information is correct by clicking **Next**.
4. Take note of the Username provided to you. Click **Set Password**.
5. Create and Confirm your new password and click **Save**. Click **Log In**.

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A closer look at Singapore's exceptional results

TIMSS 2015* Grade 8

Singapore	621
Korea	606
Chinese Taipei	599
Hong Kong SAR	594
Japan	586
Russian Federation	538
Kazakhstan	528
Canada	527
Ireland	523
England	518
United States	518
Slovenia	516
Hungary	514
Norway	512
Lithuania	511

Trends in International Math and Science Study (TIMSS)

Since the Trends in International Math and Science Study (TIMSS) began in 1995, Singapore has consistently ranked at the top. The table displayed here shows the top countries from the most recent report, with Singapore ranked 1st and outperforming the United States by 103 points.

[*timss2015.org/timss-2015/mathematics/student-achievement](http://timss2015.org/timss-2015/mathematics/student-achievement)

OECD Programme for International Student Assessment (PISA)

In 2015, Singapore participated in the PISA study, which assesses 15-year-olds in industrialized countries. Singapore not only ranked 1st, but also scored significantly above the international average of 490 with a score of 564, while the United States scored below the average with a score of 470.

**oecd.org/pisa/pisa-2015-results-in-focus.pdf

PISA Mathematics Scale 2015**

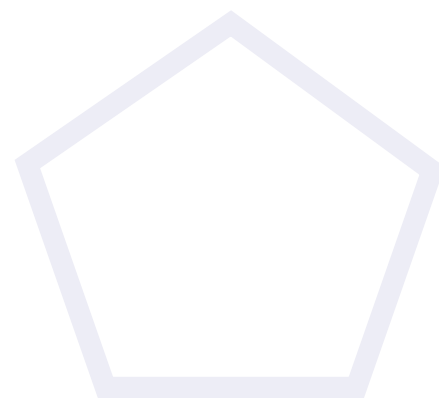
Singapore	564
Hong Kong	548
Macao	544
Taiwan	542
Japan	532
China	531
Korea	524
Switzerland	521
Estonia	520
Canada	516
Netherlands	512
Denmark	511
Finland	511
Slovenia	510
Belgium	507
Germany	506
Poland	504
Ireland	504
Norway	502
Austria	497
New Zealand	495
Viet Nam	495
Russia	494
Sweden	494
Australia	494
France	493
United Kingdom	492
Czech Republic	492
Portugal	492
International Average	490
Italy	490
Iceland	488
Spain	486
Luxembourg	486
Latvia	482
Malta	479
Lithuania	478
Hungary	477
Slovak Republic	475
Israel	470
United States	470

A results-driven framework for student achievement

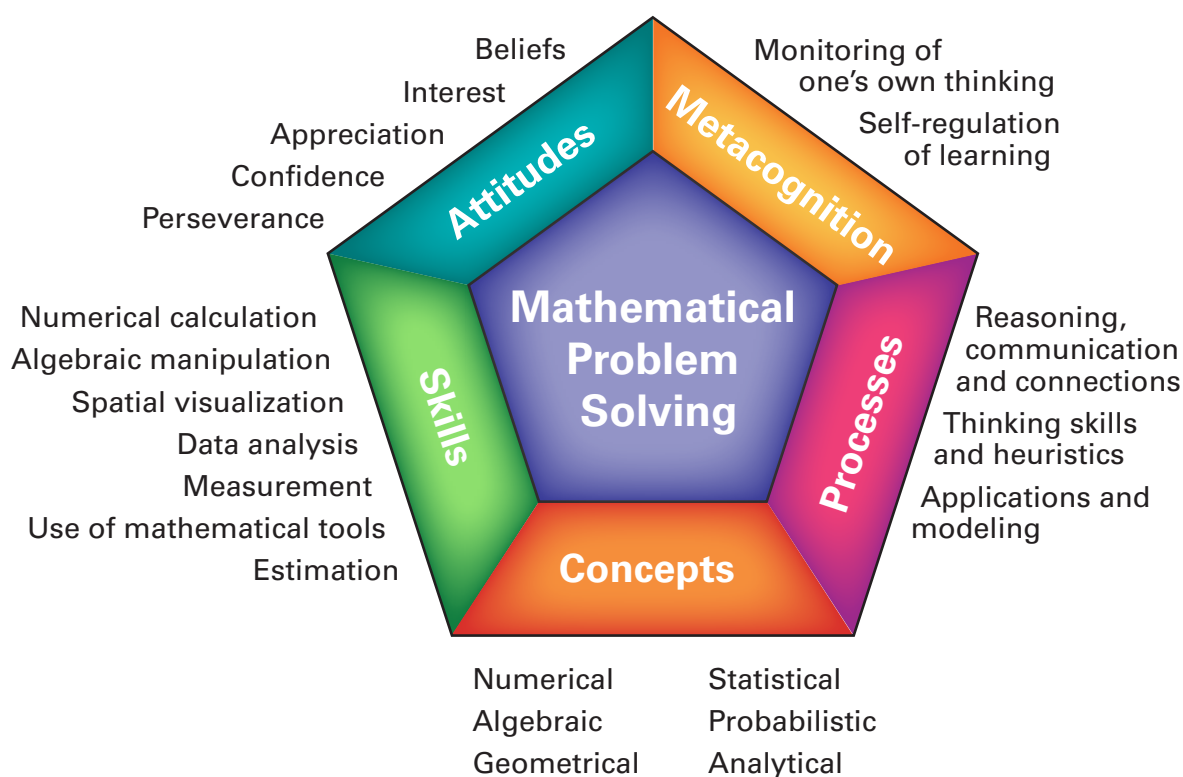
Build confidence in **PROBLEM SOLVING**.

Math in Focus is based on the framework developed by the Singapore Ministry of Education. It draws on best practices from around the world and highlights problem solving as the focus of mathematical learning.

A key differentiator for Singapore Math® is its focus on attitudes and metacognition. In order for students to excel, they must develop positive attitudes about math, have the confidence to persevere, and develop the ability to monitor their own thinking. This sets the stage for international achievement.



Singapore Math® Framework



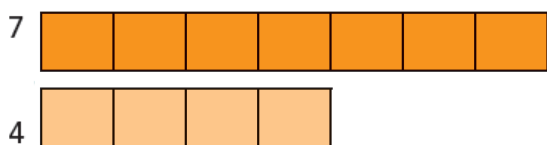
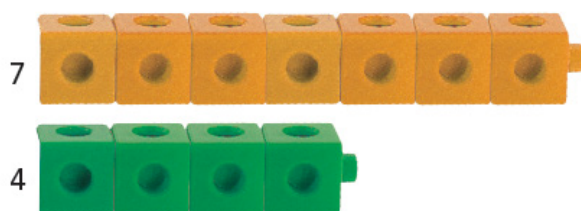
From the Singapore Ministry of Education

Build understanding with **VISUAL LEARNING**.

The key to becoming a successful problem solver is the ability to visualize mathematical situations.

Math in Focus teaches concepts with consistent and effective visuals that lead to deeper understanding of symbolic representations.

Understand the meaning of **ratio**.



7:4

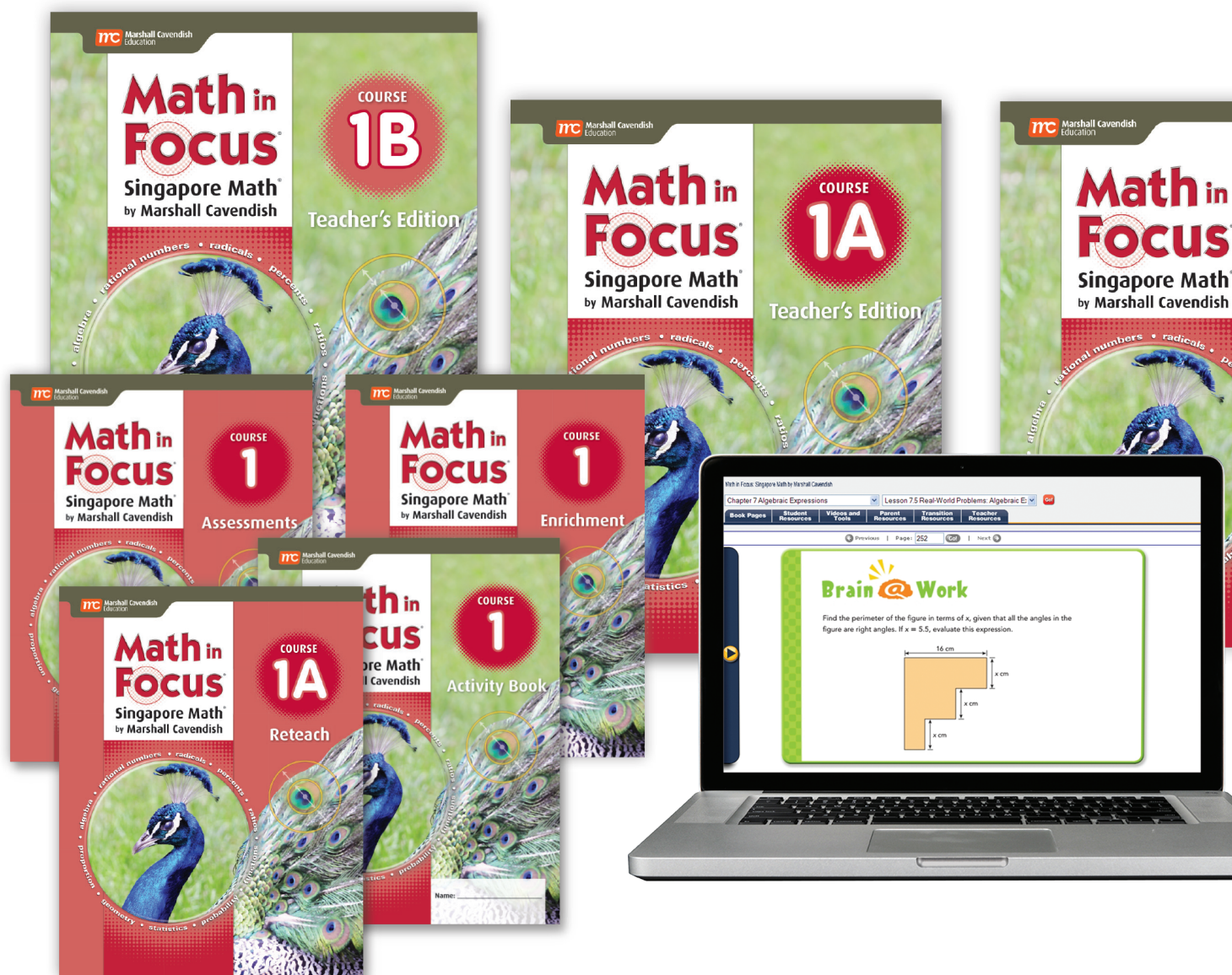
Example from Course 1, Student Book A, page 118

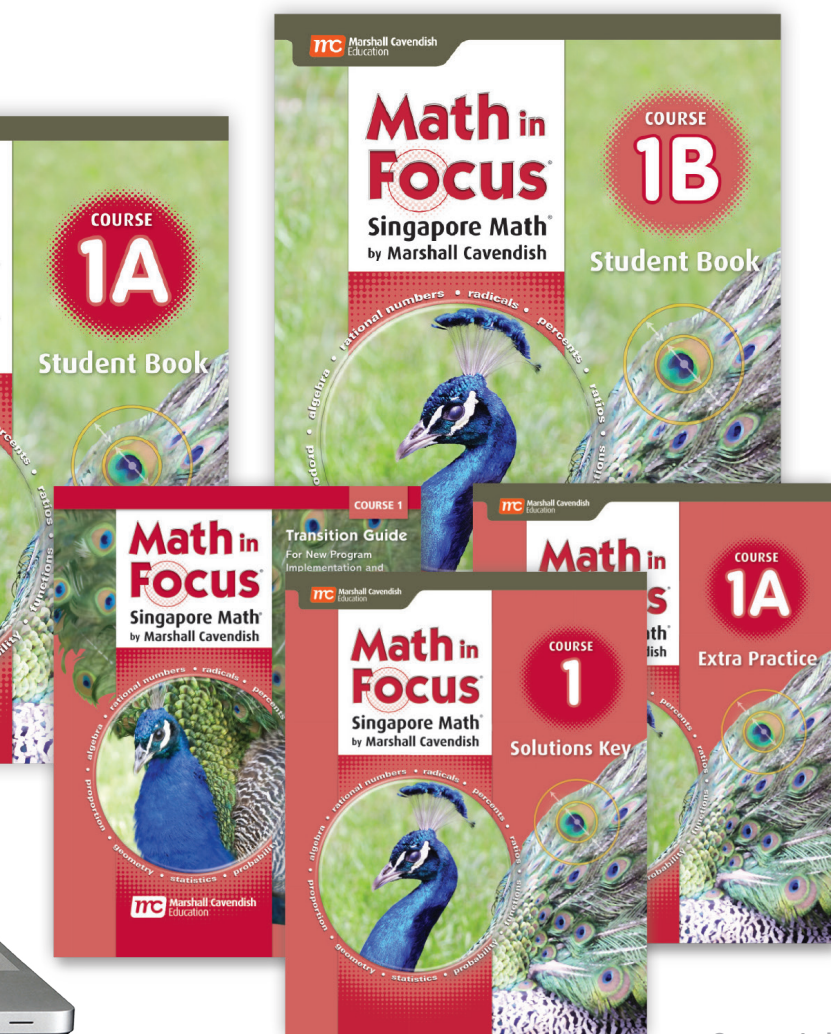
Students build understanding of new concepts through **visualization** and **pictorial representations** such as bar models.

Students move on to symbolic representations when they have enough context to **understand** what they mean.

Math in Focus is your complete K–8 solution

Robust print and technology resources provide everything you need to support student mastery.





Course 1 shown



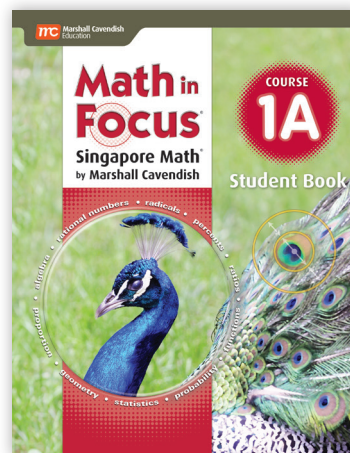
Math in Focus includes comprehensive print and digital resources for:

- ✓ Easy Planning
- ✓ Transition
- ✓ Instruction and Practice
- ✓ Differentiated Instruction, including RtI and Enrichment
- ✓ Assessment

Math in Focus[®]

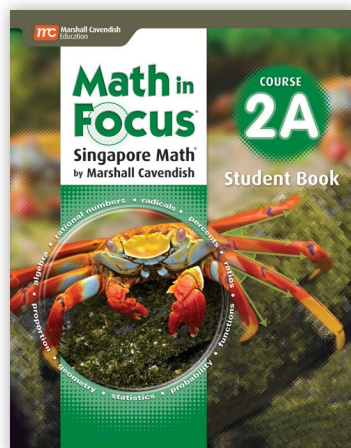
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Table of Contents



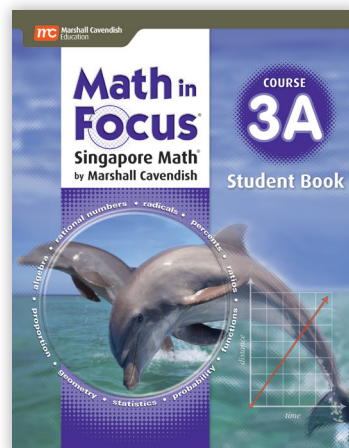
COURSE 1

- | | |
|-------------------|---|
| Chapter 1 | Positive Numbers and the Number Line |
| Chapter 2 | Negative Numbers and the Number Line |
| Chapter 3 | Multiplying and Dividing Fractions and Decimals |
| Chapter 4 | Ratio |
| Chapter 5 | Rates |
| Chapter 6 | Percent |
| Chapter 7 | Algebraic Expressions |
| Chapter 8 | Equations and Inequalities |
| Chapter 9 | The Coordinate Plane |
| Chapter 10 | Area of Polygons |
| Chapter 11 | Circumference and Area of a Circle |
| Chapter 12 | Surface Area and Volume of Solids |
| Chapter 13 | Introduction to Statistics |
| Chapter 14 | Measures of Central Tendency |



COURSE 2

- Chapter 1** The Real Number System
- Chapter 2** Rational Number Operations
- Chapter 3** Algebraic Expressions
- Chapter 4** Algebraic Equations and Inequalities
- Chapter 5** Direct and Inverse Proportion
- Chapter 6** Angle Properties and Straight Lines
- Chapter 7** Geometric Construction
- Chapter 8** Volume and Surface Area of Solids
- Chapter 9** Statistics
- Chapter 10** Probability



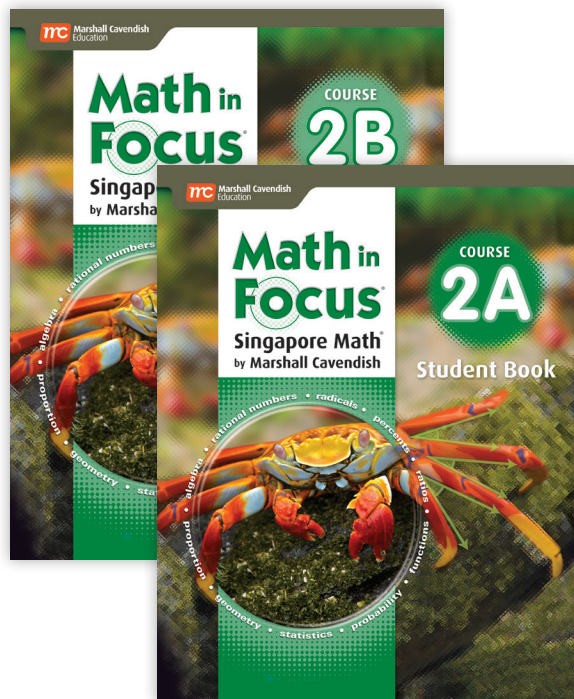
COURSE 3

- Chapter 1** Exponents
- Chapter 2** Scientific Notation
- Chapter 3** Algebraic Linear Equations
- Chapter 4** Lines and Linear Equations
- Chapter 5** Systems of Linear Equations
- Chapter 6** Functions
- Chapter 7** The Pythagorean Theorem
- Chapter 8** Geometric Transformations
- Chapter 9** Congruence and Similarity
- Chapter 10** Statistics
- Chapter 11** Probability

Everything you need to promote mastery

Core Components

Student Books focus on classroom learning, discussion, practice, and problem solving. Corresponding **Teacher's Editions** provide meaningful support and teaching suggestions.



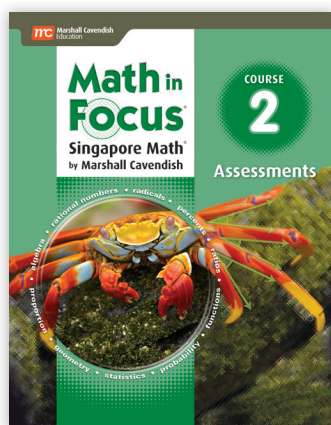
Student Book A and B



Teacher's Edition A and B

ASSESSMENTS

Diagnostic chapter pretests help teachers plan instruction. Chapter tests in test-prep format provide formal assessment opportunities. Benchmark, Mid-Year, and End-of-Year assessments provide further measures of students' mastery.



Assessments



Family Letter

FAMILY LETTERS AND ACTIVITIES

These include newsletters in English and Spanish that promote family involvement with chapter vocabulary and concepts.

Differentiation Resources

FOR TRANSITION

The **Transition Guide** and **Online Transition Map** are intervention resources for students whose knowledge of prerequisite skills and concepts is weak.

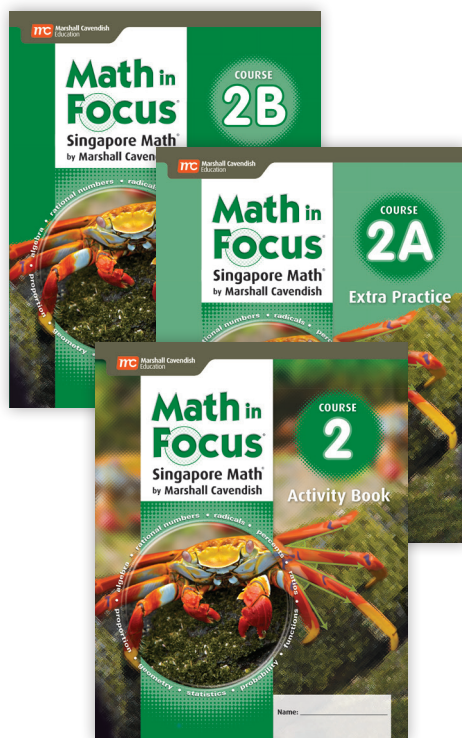
ENGLISH LANGUAGE LEARNERS

The simple language and powerful mathematical models in **Math in Focus** make the entire program inherently accessible to English language learners. Additionally, the Teacher's Editions provide lesson-specific suggestions for facilitating instruction for English language learners.

FOR STRUGGLING LEARNERS

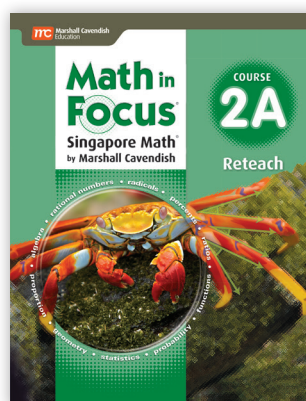
Reteach provides more exposure to concepts for those students who need more time to master new skills or concepts. The Teacher's Editions provide tips for helping struggling students at point of use.

Extra Practice A and B

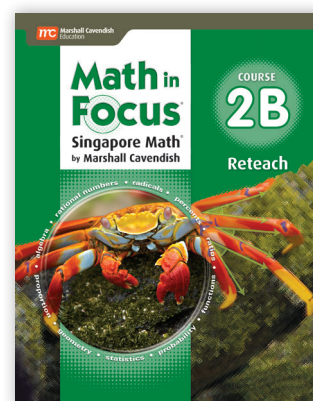


Activity Book

Transition Guide



Reteach A and B



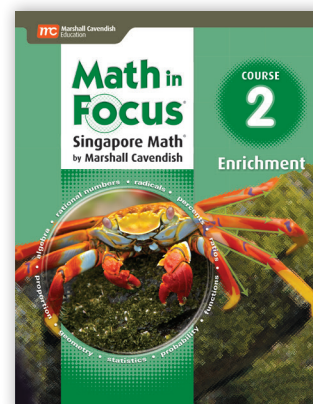
FOR ON-LEVEL STUDENTS

Extra Practice provides more practice for on-level students and are similar to the Practice exercises in the Student Books.

The **Activity Book** contains projects and activities to deepen students' mathematical understanding.

FOR ADVANCED STUDENTS

Enrichment provides exercises for advanced students seeking an additional challenge.



Enrichment

Technology

Interactive online support enhances every lesson.



ONLINE TEACHER'S EDITIONS

The online **Math in Focus** Teacher's Editions provide online planning and lesson support. Teachers can log on anytime from any computer with an Internet connection.

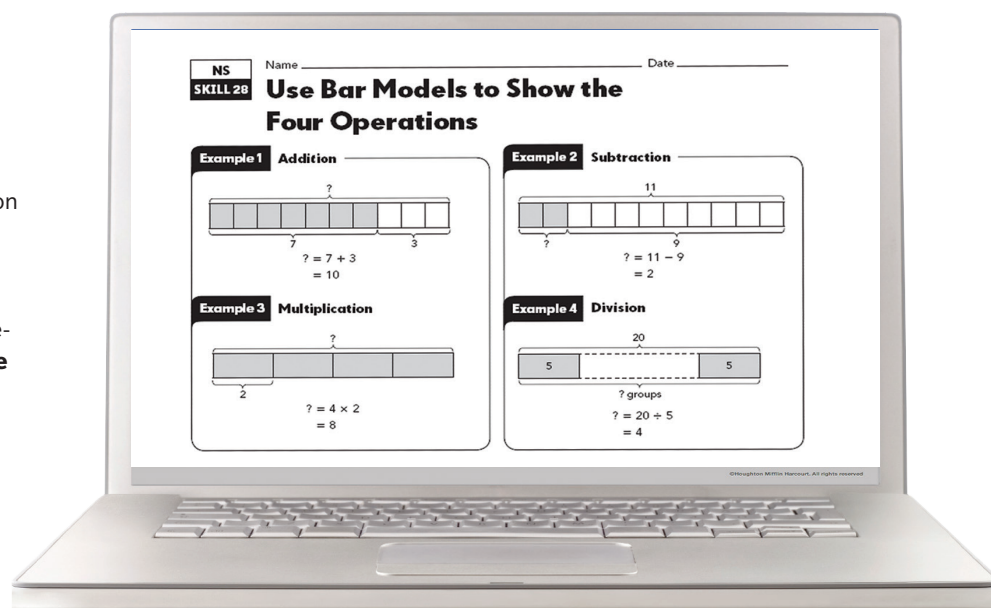
ONLINE STUDENT BOOKS

The online **Math in Focus** Student Books provide students access to their Student Books at school or from home.



ONLINE TRANSITION RESOURCE MAP

Designed to be used in conjunction with the print **Transition Guide**, this online intervention and transition resource makes it easy to locate and print previous grade-level **Reteach** and **Extra Practice** worksheets to address transition-related knowledge and skill gaps.



ONLINE VIDEOS AND PODCASTS FOR TEACHERS AND PARENTS

Teachers can access math background videos and author podcasts to prepare for lessons. Parents can learn more about Singapore Math® and how to help their children succeed.



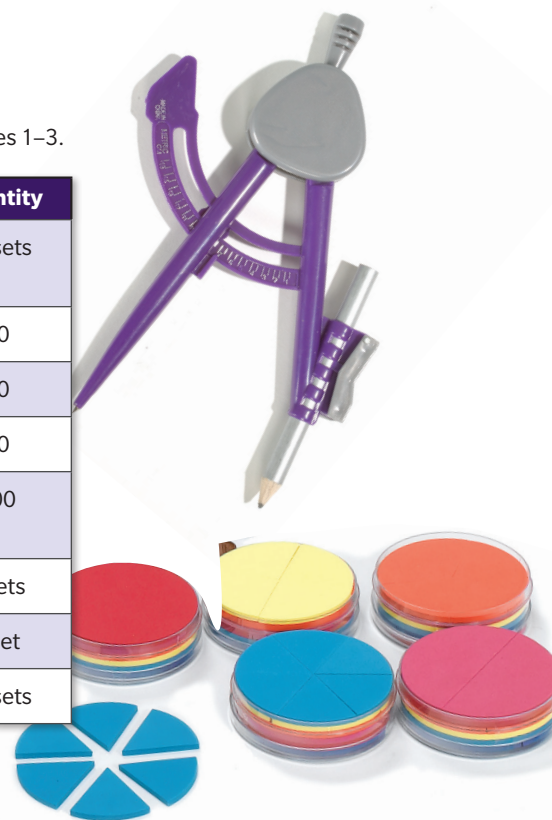
Online Videos and Podcasts

Courses 1–3 Manipulative Kit

(accommodates classrooms of up to 30 students)

The following materials are included in the **Math in Focus** Classroom Manipulative Kit for Courses 1–3.

Manipulatives	Quantity
Algebra Tiles™ Student Set Set of 32 pieces includes 4 squared variables, 8 variables, and 20 constants	16 sets
Compasses	30
Set Squares (Drawing Triangles)	30
Protractors	30
Unit Cubes Colorful, interlocking cubes make it easy to measure volume, mass, length, and more. Each cube measures 1 cm ³ and has a mass of 1 gram.	500
Counters 2-color (200 per set)	4 sets
Blank Dice and Labels (Set of 36)	1 set
Rainbow Fraction® Circles (Set of 51)	30 sets



Easy Planning

CHAPTER AT A GLANCE overviews in the Teacher's Editions make it easy to prepare for lessons.

Multi-day lessons allow enough time for students to reach **mastery**.

CHAPTER **4**

Chapter at a Glance

	CHAPTER OPENER Ratio Recall Prior Knowledge	LESSON 4.1 Comparing Two Quantities Pages 118–126	LESSON 4.2 Equivalent Ratios Pages 127–139
Pacing	2 days	2 days	2 days
Objectives	<ul style="list-style-type: none"> You can use a ratio to compare two quantities, and you can use ratios to solve problems. 	<ul style="list-style-type: none"> Write ratios to compare two quantities. Interpret ratios given in fraction form. Use a ratio to find what fraction one quantity is of another or how many times as great one is as the other. 	<ul style="list-style-type: none"> Write equivalent ratios. Write ratios in simplest form. Compare ratios.
Vocabulary		ratio, term	equivalent ratios, simplest form
Materials			
Resources	Student Book A, pp. 114–117 Assessments Course 1, Chapter 4 Pre-Test Transition Guide, Course 1, Skills 11–16	Student Book A, pp. 118–126 Extra Practice A, Lesson 4.1 Reteach A, Lesson 4.1	Student Book A, pp. 127–139 Extra Practice A, Lesson 4.2 Reteach A, Lesson 4.2 Activity Book, Lesson 4.2

Additional Teaching Support

- Online Teacher's Edition
- Online Professional Development Videos

LESSON 4.3 Real-World Problems: Ratios Pages 140–150	CHAPTER WRAP UP/REVIEW/TEST Brain@Work Pages 150–153
2 days	2 days
<ul style="list-style-type: none"> Solve real-world problems involving ratios. 	Reinforce, consolidate, and extend chapter skills and concepts.

Concepts and Skills Across the Courses

GRADE 5	COURSE 1	COURSE 2
<ul style="list-style-type: none"> Interpret fractions and solve problems involving operations with fractions and mixed numbers. Solve real-world problems with fractions and mixed numbers by using fraction models or equations to represent the problem. Use multiplication and division to convert like measurement units. 	<ul style="list-style-type: none"> Use ratio reasoning and various models to model and interpret ratios and solve real-world problems, e.g., tables, bar models, equations. Make tables of equivalent ratios and use the tables to compare ratios. Use ratio reasoning to convert, manipulate, and transform measurement units. 	<ul style="list-style-type: none"> Compute unit rates associated with ratios of fractions involving measurement units. Recognize and represent proportional relationships in tables, graphs, equations, diagrams, and verbal descriptions. Use proportional relationships to solve multi-step real-world problems.

Every Day Counts® ALGEBRA READINESS

The November activities in the Pacing Chart provide:

- Review of factors, prime and composite numbers, and patterns in rectangular arrays (Ch1)
- Practice of mathematical relationships in patterns (Ch6)
- Preview of visual models for decimals, fractions, and percents (Ch6)

Chapter 4 Chapter at a Glance 114B

A **skills trace** highlights previous and future connections.

MATH BACKGROUND pages in the Teacher's Editions provide embedded professional development.

Before each chapter, refresh your knowledge of math concepts and Singapore Math® strategies with the **Math Background** feature.



Math Background

Additional Teaching Support

- Online Transition Guide
- Online Professional Development Videos

Chapter 4 Ratio

From Fractions to Ratios

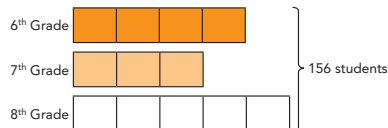
- In this chapter, students extend concepts learned with fractions to ratios. Along with writing equivalent ratios and writing ratios in simplest form, they learn to use comparison models and the unitary method to solve many types of ratio problems.

Ratios involving three quantities

- In addition to solving ratio problems involving two quantities, students will solve problems involving three quantities.

A band includes students from 6th grade, 7th grade, and 8th grade in the ratio 4 : 3 : 5. There are 156 students in the band. How many students are in 8th grade?

Solution



Total number of units = $4 + 3 + 5 = 12$
 12 units \rightarrow 156 students
 1 unit $\rightarrow \frac{156}{12} = 13$ students
 5 units $\rightarrow 5 \times 13 = 65$ students
 65 students in the band are in 8th grade.

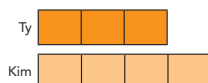
Problems involving two sets of ratios

- Students will solve problems involving two related sets of ratios.

The ratio of Ty's age to Kim's age is 3 : 4.
 The ratio of Kim's age to Luz's age is 8 : 5.
 Luz is 10 years old. How old is Ty?

Solution

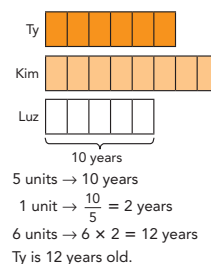
Start by drawing a model for Ty : Kim.



Use equivalent ratios to get a common term for Kim's age in both ratios. Draw new models.

$$\text{Ty : Kim} = 3 : 4 = 6 : 8$$

$$\text{So, Ty : Kim : Luz} = 6 : 8 : 5$$

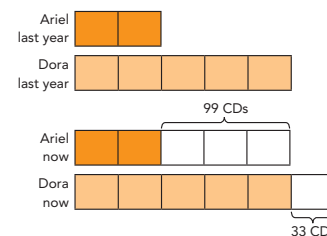


Problems involving changing ratios

- Students will also solve problems involving ratios that change.

Last year, the ratio of Ariel's CDs to Dora's was 2 : 5.
 This year, Ariel got another 99 CDs and Dora got 33.
 The ratio is now 5 : 6 and Ariel has the same number of CDs as Dora had last year. How many CDs does Ariel have this year?

Solution



1 unit \rightarrow 33 CDs
 5 units $\rightarrow 5 \times 33 = 165$ CDs
 Ariel has 165 CDs this year.

Teacher Support

Teacher's Editions with **BUILT-IN SUPPORT** let you spend more time teaching and less time planning.

Pacing guides indicate how to spread instruction across multiple days.

5-minute Warm Ups get students ready for the lesson.

Technology resources enhance instruction and aid in planning.

4.1 Comparing Two Quantities

KEY CONCEPTS

- A ratio is another way to compare two numbers or quantities with the same units.
- You can interpret ratios given in fraction form.
- You can use a ratio to find what fraction one quantity is of another or how many times as great one is as the other.

PACING

DAY 1 Pages 118–122

DAY 2 Pages 122–126

Materials: none



5-minute Warm Up

- 3 out of 5 students are girls. What fraction of the students are girls? $\frac{3}{5}$
- There 11 boys and 12 girls in a class. What fraction of the class are boys? $\frac{11}{23}$



Also available on Teacher One Stop.

4.1

Comparing Two Quantities

Lesson Objectives

- Write ratios to compare two quantities.
- Interpret ratios given in fraction form.
- Use a ratio to find what fraction one quantity is of another or how many times as great one is as the other.

Vocabulary
ratio term

Learn Understand the meaning of ratio.

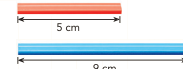
You can compare numbers or quantities by comparing their sizes.

Compare 7 and 4.



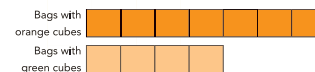
7 is greater than 4.

Compare 5 centimeters and 9 centimeters.



5 centimeters is shorter than 9 centimeters.

Another way to compare numbers or quantities is to use a ratio. The numbers or quantities you are comparing form the **terms** of a ratio. Suppose there are 7 bags of orange cubes and 4 bags of green cubes. Each bag has an equal number of cubes.



So, the ratio of the number of bags of orange cubes to the number of bags of green cubes is 7 : 4. 7 and 4 are the terms of the ratio.

The ratio does not give the actual number of cubes. Because each bag has an equal number of cubes, the ratio 7 : 4 also means that there are 7 orange cubes for every 4 green cubes.



DAY 1

Learn Understand the meaning of ratio.

Ask How can you compare the numbers 7 and 4?
Possible answer: 7 is greater than 4. How can you compare the lengths 5 centimeters and 9 centimeters?
Possible answer: 5 centimeters is shorter than 9 centimeters.

Explain Point out to students that you can compare numbers or quantities by comparing their sizes.

Explain Explain that you can also use a ratio to compare numbers or quantities. Point out that the numbers or quantities you are comparing form the terms of a ratio.

Model Use seven bars of the same length to represent 7 bags of orange cubes, and four bars of the same length to represent 4 bags of green cubes. Point out that each bag has an equal number of cubes.

Explain Explain that the ratio of the number of bags of orange cubes to the number of green cubes is 7 : 4.

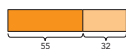
Ask What are the terms of the ratio 7 : 4? 7 and 4

Explain Explain that the ratio 7 : 4 does not give the actual number of cubes. Because each bag has an equal number of cubes, the ratio means that there are 7 orange cubes for every 4 green cubes.

Learn Use a part-part or a part-whole model to show ratios.

There were 55 adults and 32 children at a party.

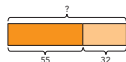
- a) Find the ratio of the number of adults to the number of children at the party. Use a part-part model.



The number of adults and the number of children are parts of a whole.

The ratio of the number of adults to the number of children at the party is 55 : 32.

- b) Find the ratio of the number of children to the total number of people at the party. Use a part-whole model.



The total number of people forms the whole.

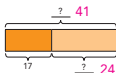
Total number of people at the party = $55 + 32$
= 87

So, the ratio of the number of children to the total number of people at the party is 32 : 87.

Guided Practice

Complete.

- 10 John keeps 17 angelfish and 24 guppies.



- a) Find the ratio of the number of angelfish to the number of guppies.
The ratio of the number of angelfish to the number of guppies is $\frac{17}{24}$ 17; 24
- b) Find the ratio of the number of guppies to the total number of fish.
Total number of fish = $\frac{17}{24} + \frac{24}{24}$ 17; 24
= $\frac{41}{24}$ 41
The ratio of the number of guppies to the total number of fish is $\frac{24}{41}$ 24; 41

Learn Use a part-part or a part-whole model to show ratios.

- a) **Model** Use two bars of different lengths to represent 55 adults and 32 children respectively. Point out to students that it is a part-part model.

Explain Explain that the number of adults and the number of children are parts of a whole.

Ask What is the ratio of the number of adults to the number of children at the party? 55 : 32

- b) **Ask** What are you asked to find in the problem? The ratio of the number of children to the total number of people at the party

Model Use to see that the number of people at the party is 87.

Ask What is the ratio of the number of children to the total number of people at the party?

Ask What is the ratio of the number of children to the total number of people at the party?

Caution

Some students may reverse the order of the terms when they write ratios. In a), after students have found the ratio of the number of adults to the number of children, ask them to find the ratio of the number of children to the number of adults. (32 : 55) Point out that the order of the terms in ratios matters. Although both ratios compare the same quantities, 55 : 32 and 32 : 55 are different ratios.

DIFFERENTIATED INSTRUCTION

Through Enrichment

- 10 Explain that it is possible to write a number of ratios

Differentiated Instruction and ELL Vocabulary Highlights help you reach all students.

Guided Practice

- 15 Point out that the number 8 in the second ratio is less than the corresponding number 64 in the first ratio. So, you divide 48 by the common factor to find the missing term.

- 16 Point out that the number 36 in the second ratio is greater than the corresponding number 4 in the first ratio. So, you multiply 9 by the same multiplying factor to find the missing term.

Best Practices

Point out to students that the "ratio reasoning" they are using to complete the table in a) works because they are assuming that each student will sell 3 youth tickets for every 5 adult tickets. If students sell different numbers of youth and adult tickets, predictions made about how many tickets will be sold may be inaccurate.

Guided Practice

Find the missing term in each pair of equivalent ratios.

15 $\frac{6}{30} = \frac{7}{35}$ 5; 5

16 $\frac{28}{7} = \frac{42}{6}$ 7; 7

15 $48 : 64 = \frac{?}{8}$ 6

16 $4 : 9 = \frac{?}{36}$ 81

Learn Work with tables of ratios.

- a) Students in the school musical are going to sell tickets. Each student is expected to sell 3 youth tickets and 5 adult tickets. The students use a table to predict how many tickets will be sold. How many tickets will be sold if 50 students sell tickets?

Number of Students	Number of Youth Tickets	Number of Adult Tickets
1	3	5
2	6	10
3	9	15
4	12	20

Notice that the ratio of the number of youth tickets to the number of adult tickets is the same for all the rows in the table. All the ratios can be written in simplest form as 3 : 5.

$\frac{6}{3} = \frac{10}{5}$ Divide by the common factor 2.

$\frac{9}{3} = \frac{15}{5}$ Divide by the common factor 3.

$\frac{12}{3} = \frac{20}{5}$ Divide by the common factor 4.

You can use the ratio 3 : 5 to find how many tickets will be sold if more students sell tickets.

Best Practices provide tips and opportunities to incorporate critical thinking into instruction.

Learn Work with tables of ratios.

- a) **Ask** What are you asked to find in the problem? The number of tickets that will be sold if 50 students sell tickets. What information in the problem can help you solve the problem? Each student is expected to sell 3 youth tickets and 5 adult tickets.

Explain Set up a table showing the number of students in one column, the number of youth tickets in a second column, and the number of adult tickets in a third column. Work with students to fill out the table for 1 student, 2 students, 3 students, and 4 students.

Explain Tell students that the ratio of the number of youth tickets to the number of adult tickets for all the rows in the table is 3 : 5 in simplest form. Show them that $6 : 10 = 3 : 5$, $9 : 15 = 3 : 5$, and $12 : 20 = 3 : 5$ using division by the common factors 2, 3, and 4 respectively. Explain that you can use the ratio 3 : 5 to find how many tickets will be sold if more students sell tickets.

Student Support

HIGHLY VISUAL LESSONS connected to real-world applications support students in mastering concepts.

Each chapter opens with an example of a **real-world application** of the concept being learned.

Big Ideas help students focus on key concepts.

CHAPTER

4

Ratio

4.1 Comparing Two Quantities

4.2 Equivalent Ratios

4.3 Real-World Problems: Ratios

How can math help you cook?

Have you ever seen a recipe for a loaf of bread? The recipe tells you how much of each type of ingredient to use. You might need 1 cup of buttermilk and 3 cups of flour to make a loaf of bread. The ratio 1 to 3 describes the relationship between the number of cups of buttermilk and the number of cups of flour in the bread.

Now, suppose you want to make 5 loaves of bread. You need to increase the number of cups of buttermilk and the number of cups of flour you use. In this chapter, you will learn how to use ratios to solve problems like “scaling up” the amounts of ingredients in a recipe.



- You can use a ratio to compare two quantities, and you can use ratios to solve problems.



4.1

Comparing Two Quantities

Lesson Objectives

- Write ratios to compare two quantities.
- Interpret ratios given in fraction form.
- Use a ratio to find what fraction one quantity is of another or how many times as great one is as the other.

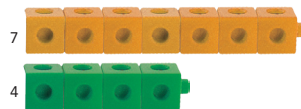
Vocabulary

ratio term

Understand the meaning of **ratio**.

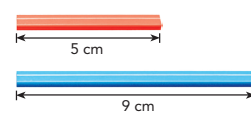
You can compare numbers or quantities by comparing their sizes.

Compare 7 and 4.



7 is greater than 4.

Compare 5 centimeters and 9 centimeters.



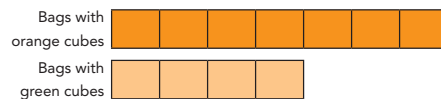
5 centimeters is shorter than 9 centimeters.

Another way to compare numbers or quantities is to use a ratio.

The numbers or quantities you are comparing form the **terms** of a ratio.

Suppose there are 7 bags of orange cubes and 4 bags of green cubes.

Each bag has an equal number of cubes.



So, the ratio of the number of bags of orange cubes to the number of bags of green cubes is 7 : 4.

7 and 4 are the terms of the ratio.

The ratio does not give the actual number of cubes. Because each bag has an equal number of cubes, the ratio 7 : 4 also means that there are 7 orange cubes for every 4 green cubes.



Students learn to **visualize concepts** using consistent models, including bar models.

Thought bubbles teach students to monitor their own thinking.

Student Support

Discussion and journal writing promote
HIGHER-ORDER THINKING.

3.1

Adding Algebraic Terms

Lesson Objectives

- Represent algebraic expressions using bar models.
- Simplify algebraic expressions with decimal and fractional coefficients by adding like terms.

Represent Algebraic Expressions Using Bar Models.

You have learned that to simplify an algebraic expression like $2x + x$, where x is a variable, you add the like terms:


$$2x + x = 3x$$

In the expression $2x + x$, the terms have coefficients that are whole numbers. Algebraic terms can also have fractional or decimal coefficients.

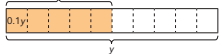
Examples: $\frac{2}{3}x$, $0.5y$, $\frac{3}{2}p$, $1.8q$

You can represent algebraic terms with rational coefficients using bar models as follows:

a) $\frac{2}{3}x$



b) $0.5y$



Divide x (the whole) into three $\frac{1}{3}x$ sections.

Divide y (the whole) into ten $0.1y$ sections.

132 Chapter 3 Algebraic Expressions

Think Math

Give a reason why you write $\frac{1}{2}p$ or $0.5y$ instead of $p\frac{1}{2}$ or $y0.5$.

Think Math

Give a reason why you write $\frac{1}{2}p$ or $0.5y$ instead of $p\frac{1}{2}$ or $y0.5$.

Think Math bubbles challenge students to consider both how and why math concepts work.

Math Journals

develop students' critical thinking skills as they justify their solutions and critique the reasoning of others.



Math Journal Describe a situation that each ratio could represent.

14 $5 : 16$

15 $98 : 3$

16 $1,000 : 1$

HANDS-ON ACTIVITIES and TECHNOLOGY ACTIVITIES

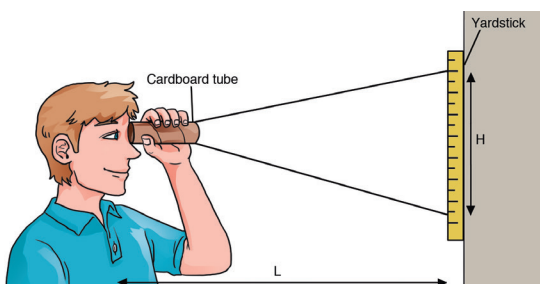
develop student engagement.



Hands-On Activity

IDENTIFY DIRECT PROPORTION IN AN EXPERIMENT

Work in pairs.



STEP 1 Make a table like the one shown.

Distance from the Wall (L feet)	1	2	3	4	5
Length of Yardstick Seen (H inches)	?	?	?	?	?
$\frac{H}{L}$	$\frac{?}{1}$	$\frac{?}{2}$	$\frac{?}{3}$	$\frac{?}{4}$	$\frac{?}{5}$

STEP 2 Tape a yardstick to the wall.

STEP 3 Stand 1 foot away from the yardstick. Look at the yardstick through the cardboard tube. How many inches of the yardstick can you see? Record the number of inches in the table.

STEP 4 Repeat **STEP 3** for the other values of L shown in the table. Then complete the table.

Math Journal What happens to H as L increases? Based on your observations, do you think H is directly proportional to L ? Explain your thinking.

Materials:

- cardboard tube
- 2 yardsticks

Hands-On Activities keep students engaged and allow them to experience mathematical concepts in a concrete way.



Technology Activity

Materials:

- spreadsheet software
- two sets of 10 data values

USE SPREADSHEET SOFTWARE TO FIND MEAN ABSOLUTE DEVIATION

STEP 1 Enter 10 data values in one row of cells.

STEP 2 Choose another cell for the mean.

STEP 3 Use the spreadsheet software's function for finding the mean to find the mean of the 10 data values. See the screen shot below.

	A	B	C	D	E	F	G	H	I	J
1										
2										
3										

STEP 4 Choose a new cell for the mean absolute deviation.

STEP 5 Use the spreadsheet software's function for finding the mean absolute deviation to find the MAD of the data values.

STEP 6 Explain what the MAD tells you about the data.

STEP 7 Enter a second set of data values and repeat **STEP 1** to **STEP 6**.

Math Journal Compare the two sets of data. Are the data values in each set clustered around the mean, or more spread out? Then compare the mean absolute deviations for the two sets of data. What do you observe?

Students learn to use technology tools strategically with **Technology Activities**.

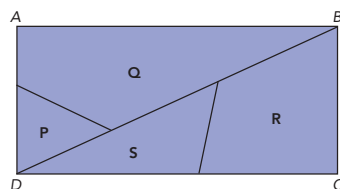
Student Support

MASTERY OF CONCEPTS allows students to solve routine and non-routine problems.

Brain@Work

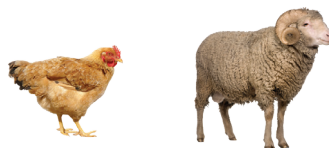
- 1 $ABCD$ is a rectangle. BD is a straight line that cuts the rectangle into equal halves. The ratio of the area of P to the area of Q is $2 : 5$, and the ratio of the area R to the area of S is $4 : 3$. The area of S is 9 square centimeters.

- a) Find the ratio of the area of R to the area of the rectangle.
b) Find the area of the rectangle.



- 2 A farmer raises chickens and sheep on his farm. The ratio of the total number of legs of the chickens to the total number of legs of the sheep is $4 : 7$. Find the minimum number of chickens and sheep on his farm. Copy and complete the table to solve the problem. (Hint: Make a list and solve the problem using guess and check.)

Number of Chickens	Number of Legs of Chickens	Number of Sheep	Number of Legs of Sheep	Number of Legs of Chickens : Number of Legs of Sheep
1	2	1	4	$2 : 4 = 1 : 2$
?	?	?	?	?
?	?	?	?	?

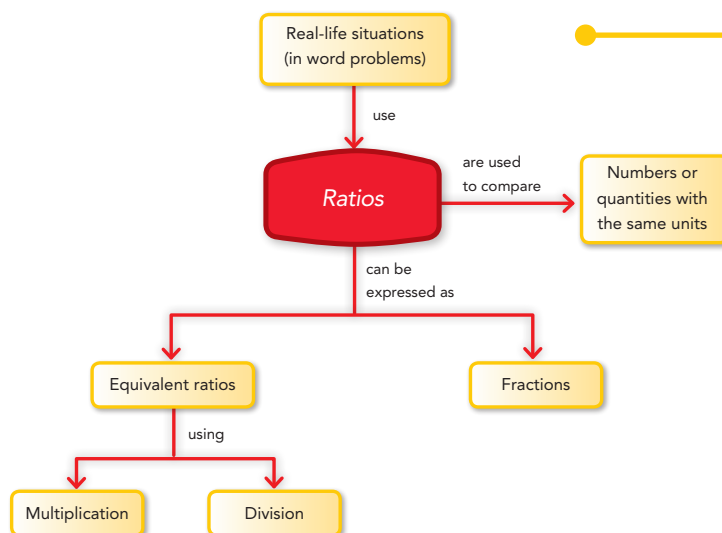


Brain@Work problems at the end of each chapter consolidate learning and challenge students to demonstrate mastery by applying it in new ways.

CHAPTER WRAP UPS consolidate learning.

Chapter Wrap Up

Concept Map



Concept Maps
reinforce learning
and help students
prepare for
Assessments.

Key Concepts

- ▶ A ratio compares two or more numbers or quantities.
- ▶ When two quantities have the same units, you can compare them using a ratio without units.
- ▶ The ratio of two numbers, such as 3 and 4, can be written in three ways:
3 to 4, 3 : 4, or $\frac{3}{4}$.
- ▶ A ratio can be expressed as another equivalent ratio by
 - multiplying the terms of the ratio by the same multiplying factor.
 - dividing the terms of the ratio by a common factor.
- ▶ Given two equivalent ratios, you can find an unknown term given the other three terms.

Differentiated Instruction

SUPPORT ALL LEARNERS with easy-to-use differentiation resources.

Differentiated Instruction

Assessment and Intervention

	ASSESSMENT	STRUGGLING LEARNERS
DIAGNOSTIC	<ul style="list-style-type: none"> Quick Check in Recall Prior Knowledge in Student Book A, pp. 115–117 Chapter 4 Pre-Test in Assessments 	<ul style="list-style-type: none"> Skills 11–16 in <i>Transition Guide</i>, Course 1
ON-GOING	<ul style="list-style-type: none"> Guided Practice Lesson Check Ticket Out the Door 	<ul style="list-style-type: none"> Reteach worksheets Extra Practice worksheets Activity Book, Chapter 4
END-OF-CHAPTER	<ul style="list-style-type: none"> Chapter Review/Test Chapter 4 Test in Assessments ExamView® Assessment Suite Course 1 	<ul style="list-style-type: none"> Reteach worksheets

ELL ENGLISH LANGUAGE LEARNERS

Review the terms ratio and term.

Model Draw a group of 4 circles. Next to it draw a group of 3 squares. Under the groups, write “4 : 3”, “4 to 3”, and “ratio”.

Say A ratio compares two numbers or amounts. This ratio compares the number of circles to the number of squares. There are four circles for every three squares. (Point to 4 : 3.) You say and read this ratio as “four to three”.

Say (Circle the 4 and 3 in 4 : 3.) Each number in a ratio is called a term. The terms in the ratio 4 : 3 are 4 and 3.

Say If the ratio of A to B is 3 : 4, then A is $\frac{3}{4}$ of B.

For definitions, see Glossary, page 272, and Online Multilingual Glossary.

ADVANCE

- Adjusting a recipe to serve an everyday activity that requires equivalent ratios. Student 4 people and scale them up to a greater number of people.
- As needed, provide direct instruction. For example, if students want to suggest that, as take their recipe and scale it up, challenge, suggest they will serve 7 or 9 people.
- Finally, it may be fun for recipe so that it makes an entire class. In that case, conversions to larger units from 28 teaspoons to 9.

To provide additional challenge:

- Enrichment, Chapter 4
- Student Book A, Brain@

Teacher’s Editions indicate the difficulty level of each practice problem to help monitor students’ progress.

Practice 4.1

Basic 1–7
Intermediate 8–10

Write two ratios to compare the quantities.

1

2 Catherine has 23 video game disks and Dylan has 37 video game disks.

3 In a school, there are 8 classes in the sixth grade and 7 classes in the seventh grade. Each class has an equal number of students.

4 6 cm and 60 g No **5** 54 kg and 54 m No

6 12 g and 45 kg Yes **7** 87 ft and 93 yd Yes

Solve. Show your work.

8 There are 123 students in a drama club. 65 of them are girls.

a) What is the ratio of the number of boys to the number of girls? 58 : 65

b) What is the ratio of the number of boys to the total number of students? 58 : 123

Practice 4.1

Assignment Guide

DAY 1 All students should complete 1 – 10.

DAY 2 All students should complete 11 – 16.

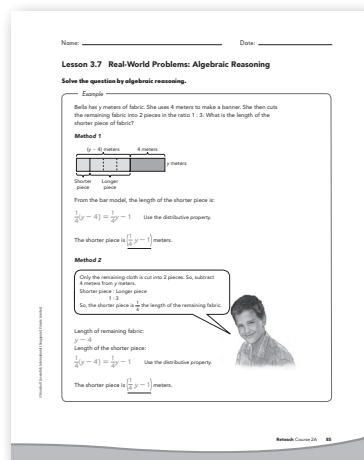
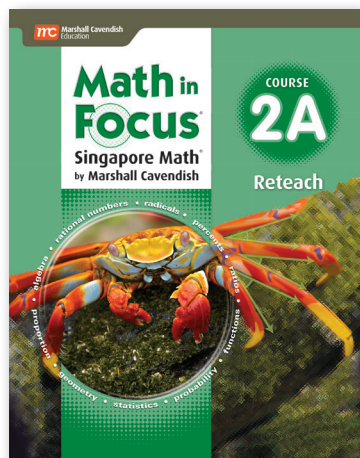
Optional: Extra Practice 4.1

RTI Lesson Checks within each lesson provide intervention options.

Before assigning homework, use the following ...	to make sure students ...	Intervene with ...
Exercises 1 and 5	<ul style="list-style-type: none"> can use a ratio to compare two numbers or quantities 	Reteach 4.1
Exercise 11	<ul style="list-style-type: none"> can use a ratio to find what fraction one quantity is of another or how many times as great one is as the other 	
Ticket Out the Door	<ul style="list-style-type: none"> use measurement conversion in order to write a ratio that compares two quantities 	

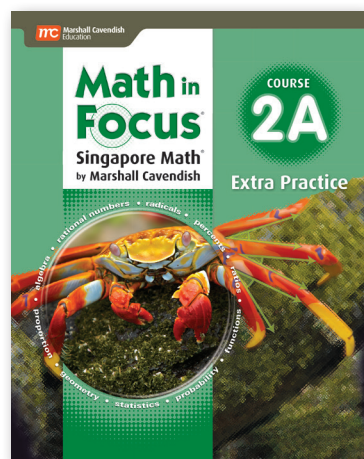
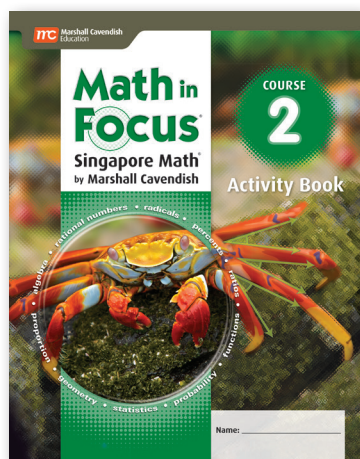
Lesson 4.1 Comparing Two Quantities 125

Resources for all levels:



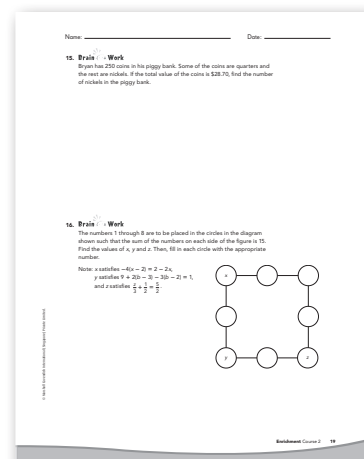
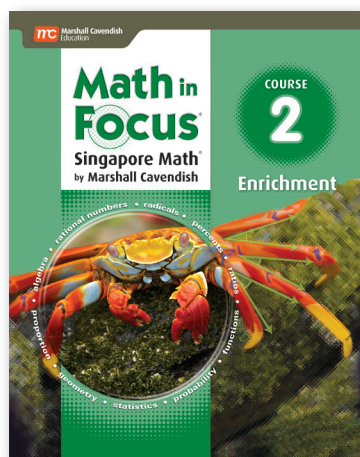
STRUGGLING LEARNERS

Reteach offers additional support for struggling students.



ON-LEVEL LEARNERS

The **Activity Book** and **Extra Practice** are ideal for solidifying understanding for on-level students.

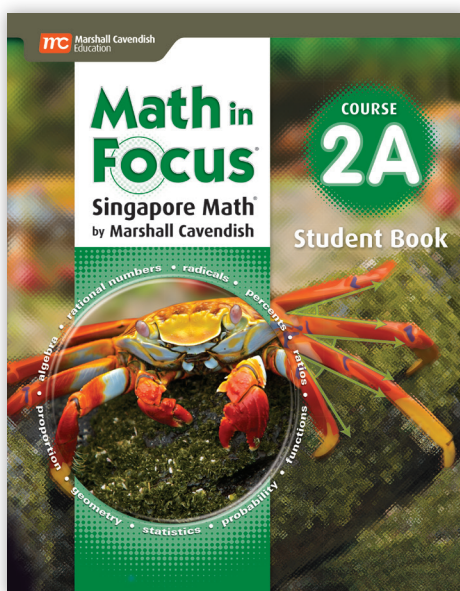
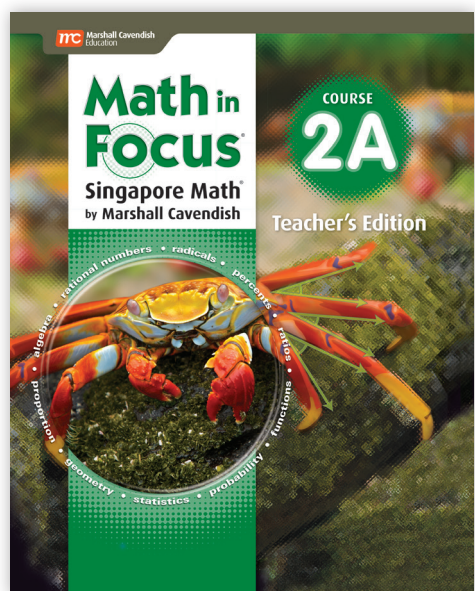


ADVANCED LEARNERS

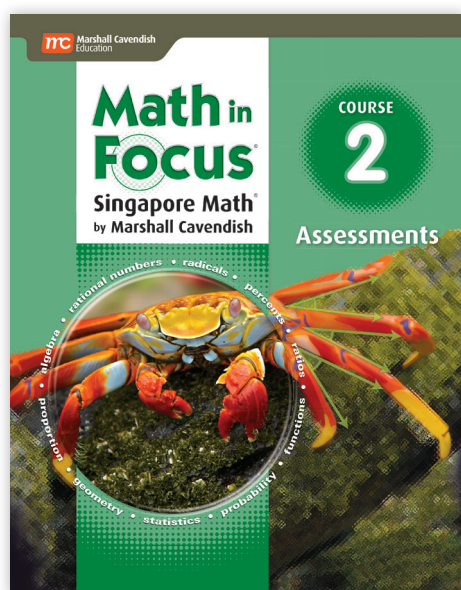
Enrichment offers challenging problems to extend learning.

Assessment

Prepare students for high stakes **ASSESSMENTS**.



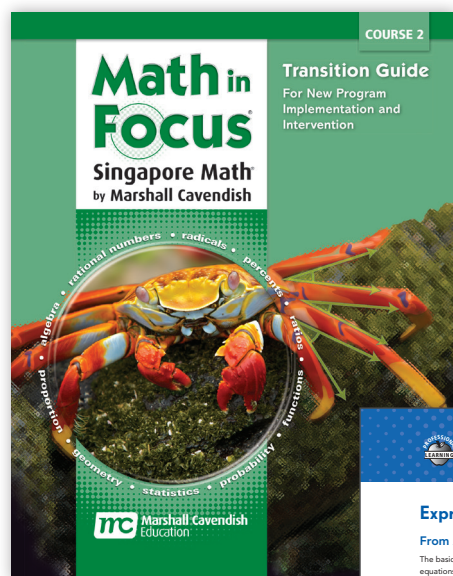
Formative assessment is supported throughout the **Teacher's Editions** and **Student Books** through Quick Checks, Ticket Out the Door, and Guided Practice.



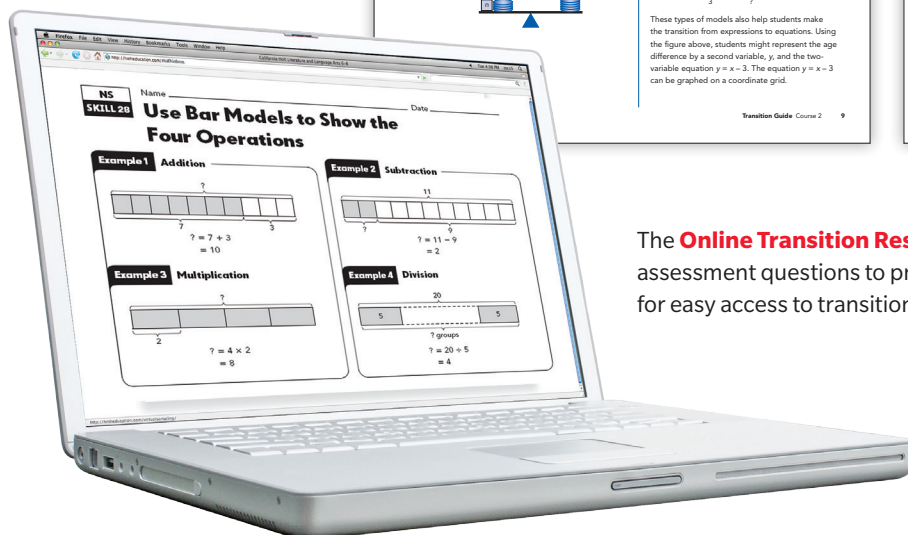
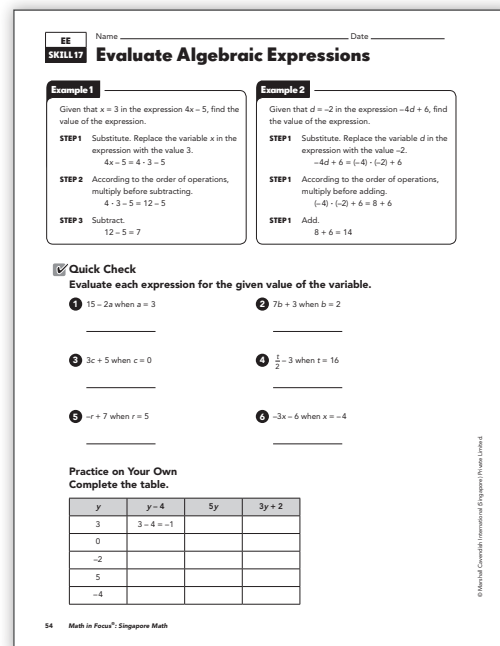
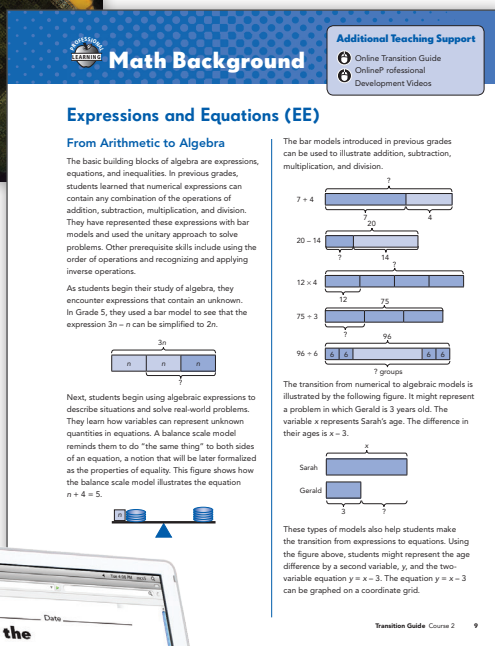
The **Assessments** book, available in print and online, provides summative assessments including pretests, chapter tests, and benchmark tests. Assessments include both routine and non-routine problems.

Transition

Fill prerequisite knowledge and skill gaps for a
SEAMLESS TRANSITION to Singapore Math®.

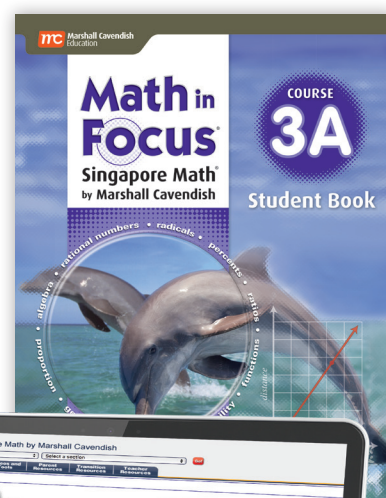
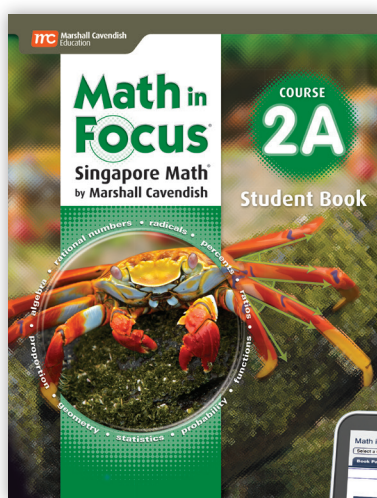
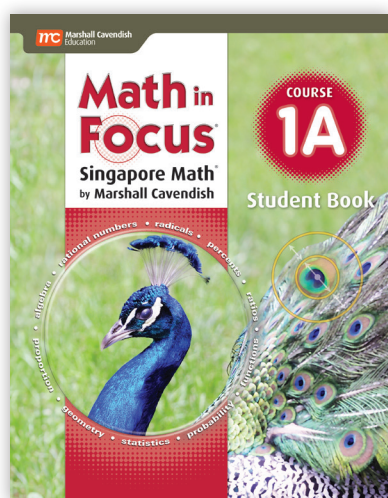


The **Transition Guide** provides math background information for teachers that address key concepts from a Singapore Math® perspective. Teaching strategies and student skill worksheets are also provided to fill student prerequisite knowledge gaps.



The **Online Transition Resource Map** also maps pretest assessment questions to previous grade-level content for easy access to transition support.

Your students deserve a world-class curriculum.



To learn more visit:

hmhco.com/mathinfocus
800.225.5425

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