ACE

GO MATHS

TEACHER GUIDE

SAMPLE PAGES

YEAR 5

ORIGO EDUCATION

Extending Decimals to Thousandths

CONTENT DESCRIPTIONS

NA104 Recognise that the number system can be extended beyond hundredths

NA105 Compare, order and represent decimals

MATHEMATICAL BACKGROUND

In this unit, students analyse the place-value aspect of decimal fractions and formally investigate the relationship between tenths, hundredths and thousandths. Students also learn that amounts involving tenths as well as hundredths can be expressed as thousandths. Two separate models are used to make these investigations. The linear model is used to reinforce the notion of relative position, while the region model is used to show the relationship between the place-value units.

LESSON OVERVIEW

9.1 Reading and Writing Hundredths

9.2 Locating Tenths and Hundredths on a Number Line

9.3 Introducing Thousandths

9.4 Relating Tenths, Hundredths and Thousandths

9.5 Locating Thousandths on a Number Line

LANGUAGE

Students will use and develop the following language:
decimal fraction, thousandths, position, relative position, region model, hundredths, common fraction, number line, distance, place value, regrouping

MATERIALS

Lesson 9.1

- *GM ACE* student journal, page 42
- Blackline Master 14 copied onto an overhead transparency
- Overhead projector
- Non-permanent marker

Lesson 9.2

- *GM ACE* student journal, page 43

Lesson 9.3

- *GM ACE* student journal, page 44
- Transparency from 9.1
- Overhead projector
- Non-permanent marker

Lesson 9.4

- *GM ACE* student journal, page 45
- *GM ACE* mentals workbook, page 17
- Transparency from 9.1
- Overhead projector
- Non-permanent marker

Lesson 9.5

- *GM ACE* student journal, page 46
- *GM ACE* mentals workbook, page 18

Optional Digital Resources and Program Blackline Masters

The lessons in this program are further supported by optional online resources.
Go to **www.origoeducation.com/go-maths-ace-support** for further information about the program blackline masters and these resources.

Assessment

CONTENT INDICATORS

On completion of this unit, the students should be able to

- **NA104**
  - **A** extend the number system to thousandths
- **NA105**
  - **B** write decimal fractions (tenths, hundredths and thousandths) in words and in numerals
  - **C** use a region model to relate tenths, hundredths and thousandths
  - **D** identify decimal fractions (tenths, hundredths and thousandths) on a number line

TECHNIQUES

The following tools can be used to assess the content indicators.

1. Written Test B D

Allow time for the students to complete the written test for Unit 9. Consider administering the test one or two weeks after completion of the unit.

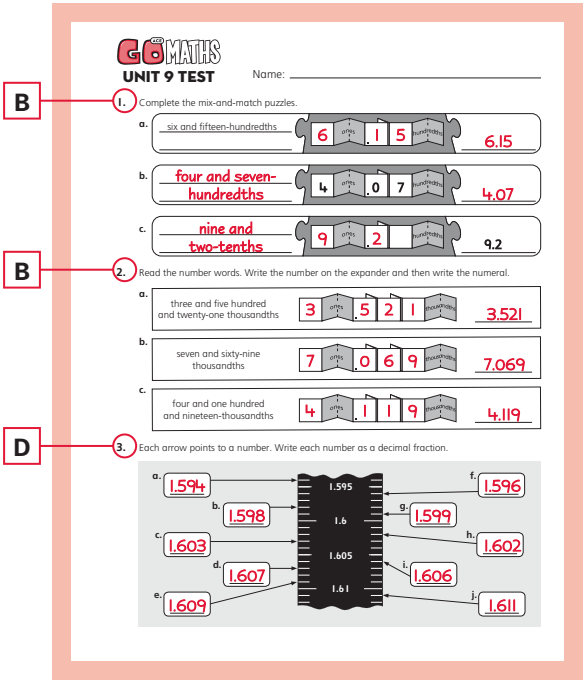
2. Student Journal Page C

Refer to *GO Maths ACE* student journal page 44.

3. Observation A

Refer to Lesson 9.3.

Unit 9 Written Test



GO MATHS
UNIT 9 TEST
Name: _____

B 1. Complete the mix-and-match puzzles.

a. six and fifteen-hundredths — 6.15
b. four and seven-hundredths — 4.07
c. nine and two-tenths — 9.2

B 2. Read the number words. Write the number on the expander and then write the numeral.

a. three and five hundred and twenty-one thousandths — 3.521
b. seven and sixty-nine thousandths — 7.069
c. four and one hundred and nineteen-thousandths — 4.119

D 3. Each arrow points to a number. Write each number as a decimal fraction.

a. 1.594
b. 1.598
c. 1.603
d. 1.607
e. 1.609
1.595
1.6
1.605
1.61
f. 1.596
g. 1.599
h. 1.602
i. 1.606
j. 1.611

RECORDING

Content Strands

Record each student's achievement of the content indicators in the box(es) for this unit alongside the relevant content description(s) on a copy of the Progress Record (page xii).

	Year 5
NA104	9
NA105	4 9 16 22

Proficiency Strands

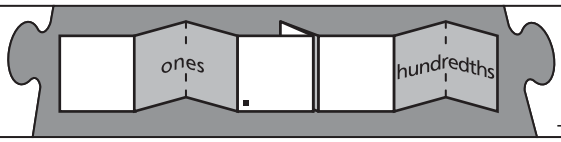
Record significant observations in the Progress Record (page xiv).

GO MATHS ACE
UNIT 9 TEST

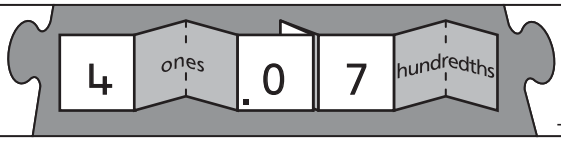
Name: _____

1. Complete the mix-and-match puzzles.

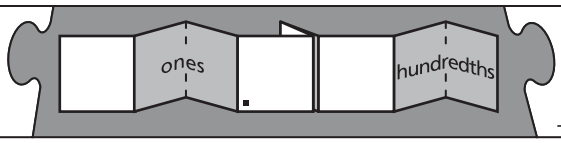
a. six and fifteen-hundredths



b.



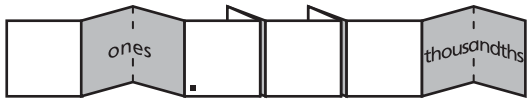
c.



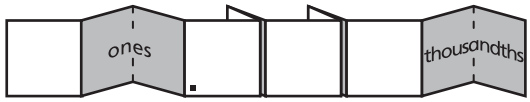
9.2

2. Read the number words. Write the number on the expander and then write the numeral.

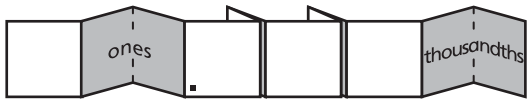
a. three and five hundred and twenty-one thousandths



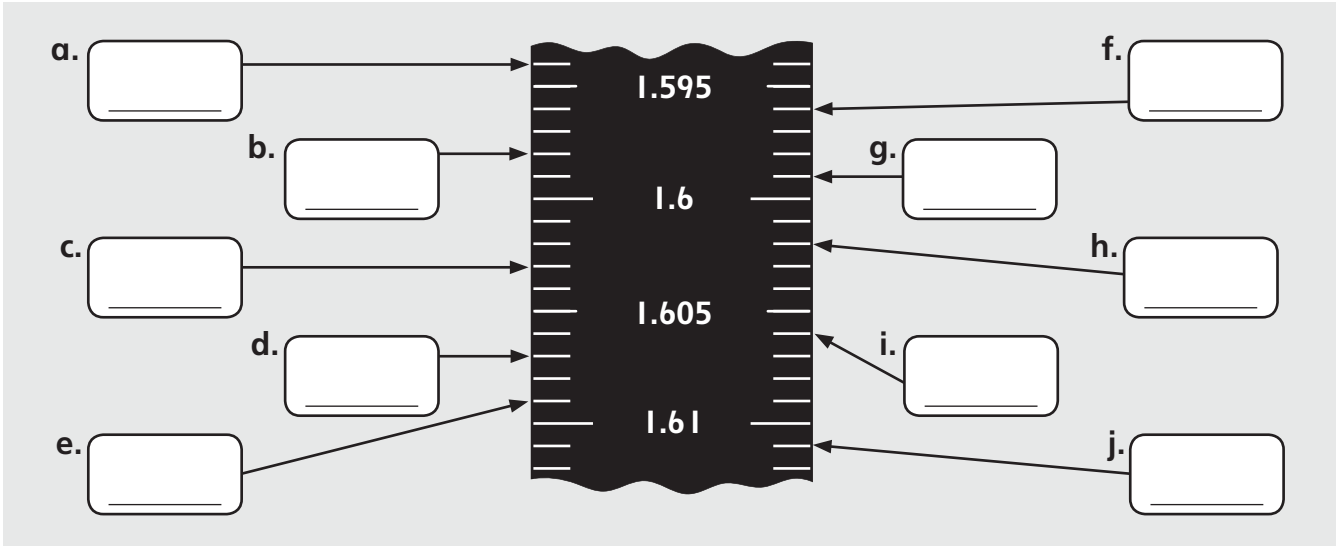
b. seven and sixty-nine thousandths



c. four and one hundred and nineteen-thousandths



3. Each arrow points to a number. Write each number as a decimal fraction.



Reading and Writing Hundredths

In this lesson, students read and write decimal fractions with one or two decimal places. The examples include teens and numbers with zeros.

DAILY NUMBER SENSE

Draw two purses and a price tag showing ***$6.45***. Say: *Imagine two people used all of their money to pay this amount. What amounts could have been in each purse? How do you know?* During the discussion add other conditions to the task, such as: *'One person paid about twice as much as the other person'.*

ACTIVITY

1. Display the whole and hundredths squares from Blackline Master 14 on the overhead projector. Indicate each of the squares and say: *Each of these is one whole. How has the second square been divided?* Bring out the fact that the second square has been divided into 100 equal parts or hundredths.
2. Colour the one whole square and three columns of the second square and ask: *What fraction of these squares have I shaded? How can we write the fraction?* Encourage a variety of responses and written forms that include one and three-tenths, one and thirty-hundredths, 1.3, $1\frac{3}{10}$ and $1\frac{30}{100}$. Ask: *What fraction of the second square is not shaded? How can we write the fraction?* Have the students write the decimal and common fractions. Emphasise reading the decimal fractions in tenths.
3. Colour five more columns in the second square and repeat Step 2. Emphasise reading the decimal fractions as hundredths.
4. Erase all the shading and colour 13 hundredths of the second square. Repeat the questions from Step 2. *Note:* Retain the transparencey for use throughout this unit.
5. Have the students work independently to complete page 42 of the *GO Maths ACE* student journal.

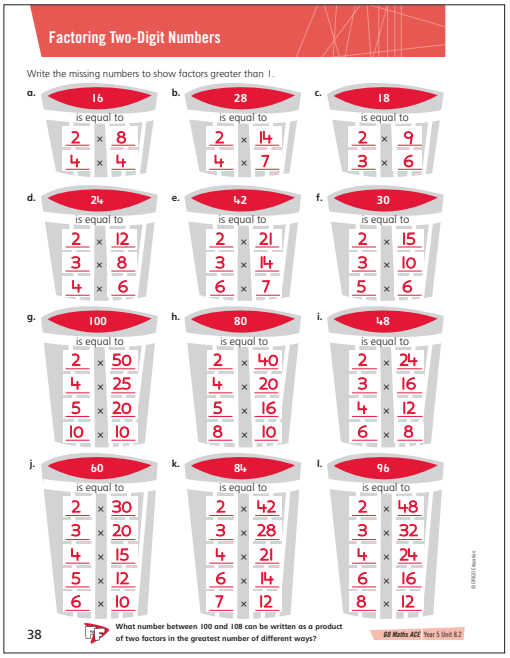
REFLECTION

1. Discuss the students' answers to page 42 of the *GO Maths ACE* student journal.
2. Write the digits ***1***, ***5*** and ***0*** on the board and ask: *What are all of the different numbers you can make with these digits written in the ones, tenths and hundredths places? How will you read the numbers?* Invite individuals to say and write the decimal fractions on the board. Ask students to help you order the numbers from least to greatest on the board. Have them explain how they know which is the least (greatest).

MATERIALS

- *GM ACE* student journal, page 42
- Blackline Master 14 copied onto an overhead transparency
- Overhead projector
- Non-permanent marker

Student Journal



Factoring Two-Digit Numbers

Write the missing numbers to show factors greater than 1.

a. 16 is equal to 2 × 8, 4 × 4

b. 28 is equal to 2 × 14, 4 × 7

c. 18 is equal to 2 × 9, 3 × 6

d. 24 is equal to 2 × 12, 3 × 8, 4 × 6

e. 42 is equal to 2 × 21, 3 × 14, 6 × 7

f. 30 is equal to 2 × 15, 3 × 10, 5 × 6

g. 100 is equal to 2 × 50, 4 × 25, 5 × 20, 10 × 10

h. 80 is equal to 2 × 40, 4 × 20, 5 × 16, 8 × 10

i. 48 is equal to 2 × 24, 3 × 16, 4 × 12, 6 × 8

j. 60 is equal to 2 × 30, 3 × 20, 4 × 15, 5 × 12, 6 × 10

k. 84 is equal to 2 × 42, 3 × 28, 4 × 21, 6 × 14, 7 × 12

l. 96 is equal to 2 × 48, 3 × 32, 4 × 24, 6 × 16, 8 × 12

38

What number between 100 and 108 can be written as a product of two factors in the greatest number of different ways?

GO Maths ACE Year 5 Unit 8.2

DAILY COMPUTATION PRACTICE

Write these number sentences on the board. Point to each in random order and have the students (as a class or individually) say the answer.

3 × ___ = 27
4 × ___ = 36
5 × ___ = 35
6 × ___ = 42
7 × ___ = 56
6 × ___ = 54
8 × ___ = 72
9 × ___ = 63
5 × ___ = 45
9 × ___ = 54

UNDERSTANDING | FLUENCY | PROBLEM SOLVING | REASONING

Locating Tenths and Hundredths on a Number Line

In this lesson, students use number lines to reinforce the concept of relative position involving decimal fractions.

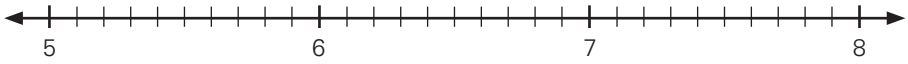
DAILY NUMBER SENSE

Repeat the Daily Number Sense discussion from the previous lesson for a price of ***$12.60***. Include conditions such as: *'One person had exactly six coins'*.

ACTIVITY

1. On the board, draw the number line shown below.

2. Write ***2.1*** on the board and ask: *Where will we draw an arrow to show this number?* Invite volunteers to describe their thinking, and ask one student to draw the arrow. During this discussion, ask: *What whole numbers are on either side of two and one-tenth? How far away is each whole number?*
3. Have each student copy the number line shown above. Write ***0.8*** on the board and ask the students to work independently to locate the decimal fraction on their number line. Then discuss the strategies the students used. During this activity, ask the students to figure out the distance to each whole number.
4. Repeat Step 3 for ***1.12***, ***0.08*** and ***2.01***. During the discussion, encourage the students to read the decimal fractions using fraction language (e.g. one and twelve-hundredths).
5. Draw additional marks and relabel the number line on the board (as shown below).



   Ask: *Where are the numbers that are one-tenth away from 6? What numbers are they?* Invite individuals to identify the numbers on the number line and write the values. Repeat for numbers that are five-hundredths away from 7 and one-hundredth away from 5.4.
6. Work with the whole class to complete Question 1 on page 43 of the *GO Maths ACE* student journal. Then have the students work independently to complete the page.

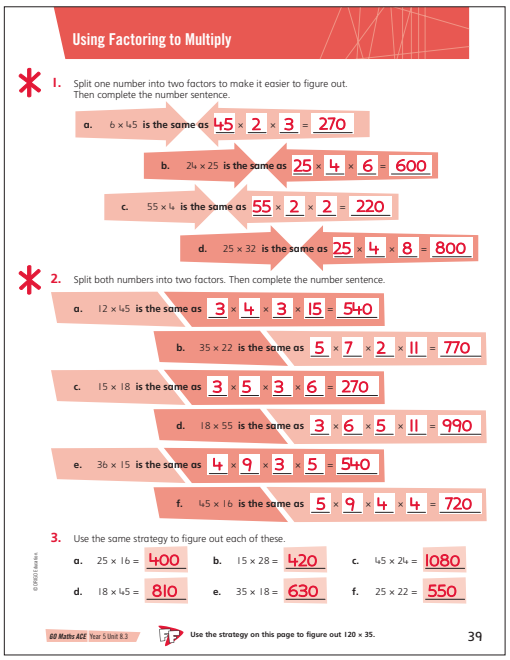
REFLECTION

1. Discuss the students' answers to page 43 of the *GO Maths ACE* student journal.
2. Have the students say the distance from each number they wrote in Question 3 to each tenth on either side and describe their thinking.

MATERIALS

- *GM ACE* student journal, page 43

Student Journal



Using Factoring to Multiply

1. Split one number into two factors to make it easier to figure out. Then complete the number sentence.

a. 6 × 45 is the same as 45 × 2 × 3 = 270
b. 24 × 25 is the same as 25 × 4 × 6 = 600
c. 55 × 4 is the same as 55 × 2 × 2 = 220
d. 25 × 32 is the same as 25 × 4 × 8 = 800

2. Split both numbers into two factors. Then complete the number sentence.

a. 12 × 45 is the same as 3 × 4 × 3 × 15 = 540
b. 35 × 22 is the same as 5 × 7 × 2 × 11 = 770
c. 15 × 18 is the same as 3 × 5 × 3 × 6 = 270
d. 18 × 55 is the same as 3 × 6 × 5 × 11 = 990
e. 36 × 15 is the same as 4 × 9 × 3 × 5 = 540
f. 45 × 16 is the same as 5 × 9 × 4 × 4 = 720

3. Use the same strategy to figure out each of these.

a. 25 × 16 = 400 b. 15 × 28 = 420 c. 45 × 24 = 1080
d. 18 × 45 = 810 e. 35 × 18 = 630 f. 25 × 22 = 550

GO Maths ACE Year 5 Unit 8.3 — Use the strategy on this page to figure out 120 × 35. — 39

DAILY COMPUTATION PRACTICE

Write these number sentences on the board. Ask the students to copy and complete them or simply write the answers.

6 × ___ = 48
7 × ___ = 42
8 × ___ = 72
9 × ___ = 36
7 × ___ = 63

21 ÷ 7 = ___
32 ÷ 8 = ___
24 ÷ 3 = ___
56 ÷ 8 = ___
54 ÷ 6 = ___

Using Place Value to Record Numbers Involving Thousandths

In this lesson, the region model is used to introduce the more formal place-value aspect of thousandths and its relationship to tenths and hundredths. *Note:* Although often impractical, always try to read a decimal fraction using place-value words (e.g. 'two hundred and eighty-four thousandths'). Students and adults at home will say the face value of the digits (e.g. 'point two eight four') but using the decimal fraction wording will reinforce the place-value concepts.

DAILY NUMBER SENSE

Repeat the Daily Number Sense discussion from 9.1 for a price of ***$4.50***. Include conditions such as: *'One person had exactly six silver coins'*.

ACTIVITY

1. Cover the bottom two squares and display the transparency on the overhead projector. Point to the square showing tenths and ask: *What do we call one of the ten equal parts that we get from one whole number? What do we write?* On the board, draw the chart shown below and write the words and numbers in the chart for one-tenth.

	ones	*tenths*
one-tenth	0.	1

2. Reveal one of the tenths in the square of hundredths and ask: *What do we call one of the ten equal parts that we get from one-tenth? What do we write?* Invite individuals to relate back to one whole to explain why the word 'one-hundredth' is used. Extend the chart as shown below.

	ones	*tenths*	*hundredths*
one-tenth	0.	1	
one-hundredth	0.	0	1

3. Reveal one of the hundredths in the square of thousandths and ask: *What do we call one of the ten equal parts that we get from one-hundredth? What do we write?* Repeat the previous discussion to bring out the fact that the original one whole is now divided into 1000 equal parts and the fraction relates to that one whole. Extend the chart as shown below.

	ones	*tenths*	*hundredths*	*thousandths*
one-tenth	0.	1		
one-hundredth	0.	0	1	
one-thousandth	0.	0	0	1

4. Have the students work independently to complete Question 1 on page 44 of the *GO Maths ACE* student journal.

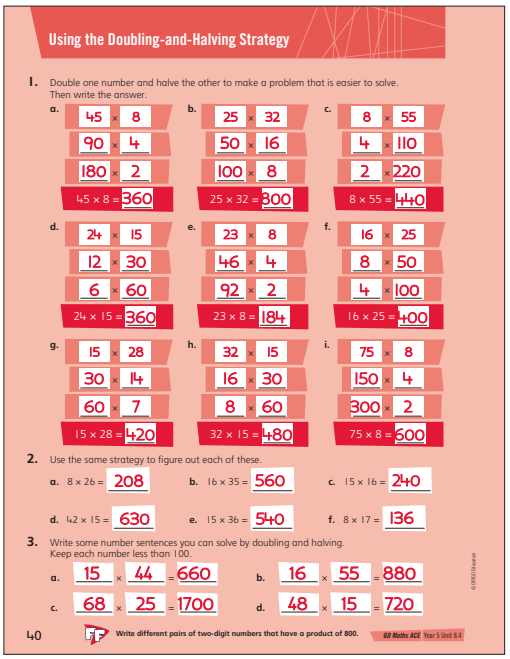
REFLECTION

1. Refer to Question 2 and ask: *How will you figure out how much of one whole square to shade?* Have the students relate the number of tenths to the columns, the hundredths to the squares and thousandths to the rows and complete the question.
2. Ask: *How will we write the decimal fractions when the words on the expander are hidden? How will we read the numbers?*

MATERIALS

- *GM ACE* student journal, page 44
- Transparency from 9.1
- Overhead projector
- Non-permanent marker

Student Journal



Using the Doubling-and-Halving Strategy

1. Double one number and halve the other to make a problem that is easier to solve. Then write the answer.

a. 45 × 8 = 360 (90 × 4, 180 × 2)
b. 25 × 32 = 800 (50 × 16, 100 × 8)
c. 8 × 55 = 440 (4 × 110, 2 × 220)
d. 24 × 15 = 360 (12 × 30, 6 × 60)
e. 23 × 8 = 184 (46 × 4, 92 × 2)
f. 16 × 25 = 400 (8 × 50, 4 × 100)
g. 15 × 28 = 420 (30 × 14, 60 × 7)
h. 32 × 15 = 480 (16 × 30, 8 × 60)
i. 75 × 8 = 600 (150 × 4, 300 × 2)

2. Use the same strategy to figure out each of these.

a. 8 × 26 = 208
b. 16 × 35 = 560
c. 15 × 16 = 240
d. 42 × 15 = 630
e. 15 × 36 = 540
f. 8 × 17 = 136

3. Write some number sentences you can solve by doubling and halving. Keep each number less than 100.

a. 15 × 44 = 660
b. 16 × 55 = 880
c. 68 × 25 = 1700
d. 48 × 15 = 720

40 Write different pairs of two-digit numbers that have a product of 800. GO Maths ACE Year 5 Unit 8.4

DAILY COMPUTATION PRACTICE

Write these number sentences on the board. Ask the students to copy and complete them or simply write the answers.

24 ÷ 6 = ___
28 ÷ 4 = ___
81 ÷ 9 = ___
48 ÷ 6 = ___
54 ÷ 6 = ___
72 ÷ 9 = ___
56 ÷ 7 = ___
42 ÷ 6 = ___
81 ÷ 9 = ___
63 ÷ 7 = ___

UNDERSTANDING | FLUENCY | PROBLEM SOLVING | REASONING

Relating Tenths, Hundredths and Thousandths

In this lesson, students use a region model and numeral expanders to reinforce the relationship between tenths, hundredths and thousandths.

DAILY NUMBER SENSE

Repeat the Daily Number Sense discussion from 9.1 with three purses and a price of ***$15.60***. Include conditions such as: *'One person paid about half of the amount'* or *'Altogether the three people used 10 coins and no notes'*.

ACTIVITY

1. Shade the whole square and four of the tenths in the second square and display the transparency on the overhead projector. Ask: *What have I shaded? What decimal fraction does this show?* Encourage the students to describe the shaded regions and then write the numeral ***1.4*** and the words ***one and four-tenths*** on the board.
2. Say: *Imagine we divide each of the tenths into hundredths. How many hundredths will we have? What is another way we can read the number?* Invite volunteers to explain that each tenth can be broken into 10 hundredths and that in four-tenths there will be 40 hundredths altogether. Write the numeral ***1.40*** and the words ***one and forty-hundredths*** on the board. Reinforce the concept that while the zero is not really needed, it helps tell the number of hundredths.
3. Repeat Step 2 by asking the students to describe the number of thousandths they would get from four-tenths.
4. Have the students work independently to complete Question 1 on page 45 of the *GO Maths ACE* student journal.
5. Ask volunteers to describe the thinking they used to decide which digits should be written on each expander. Reinforce the regrouping that occurs between places (e.g. two-tenths is the same as twenty-hundredths and two-hundred thousandths).
6. Have the students work independently to complete page 45 of the *GO Maths ACE* student journal.

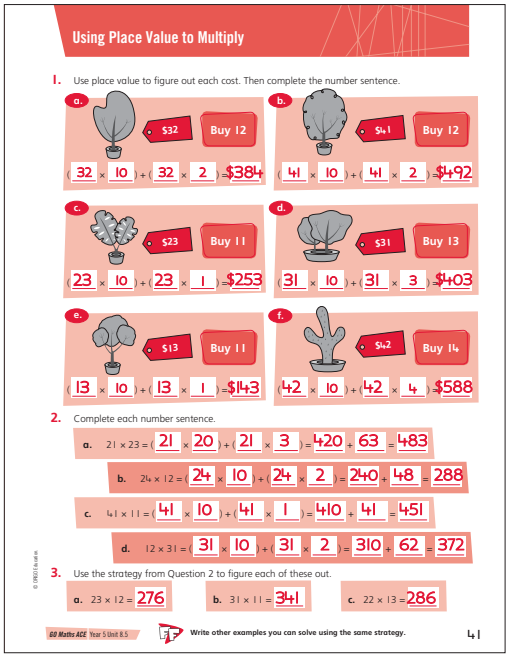
REFLECTION

Discuss the students' answers to Question 2 on page 45 of the *GO Maths ACE* student journal. Ask questions such as: *Where did you write a two (zero)? How did you know that was the place where a two (zero) should be written?*

MATERIALS

- *GM ACE* student journal, page 45
- *GM ACE* mentals workbook, page 17
- Transparency from 9.1
- Overhead projector
- Non-permanent marker

Student Journal



Using Place Value to Multiply

1. Use place value to figure out each cost. Then complete the number sentence.

a. $32 Buy 12 — (32 × 10) + (32 × 2) = $384
b. $41 Buy 12 — (41 × 10) + (41 × 2) = $492
c. $23 Buy 11 — (23 × 10) + (23 × 1) = $253
d. $31 Buy 13 — (31 × 10) + (31 × 3) = $403
e. $13 Buy 11 — (13 × 10) + (13 × 1) = $143
f. $42 Buy 14 — (42 × 10) + (42 × 4) = $588

2. Complete each number sentence.

a. 21 × 23 = (21 × 20) + (21 × 3) = 420 + 63 = 483
b. 24 × 12 = (24 × 10) + (24 × 2) = 240 + 48 = 288
c. 41 × 11 = (41 × 10) + (41 × 1) = 410 + 41 = 451
d. 12 × 31 = (31 × 10) + (31 × 2) = 310 + 62 = 372

3. Use the strategy from Question 2 to figure each of these out.

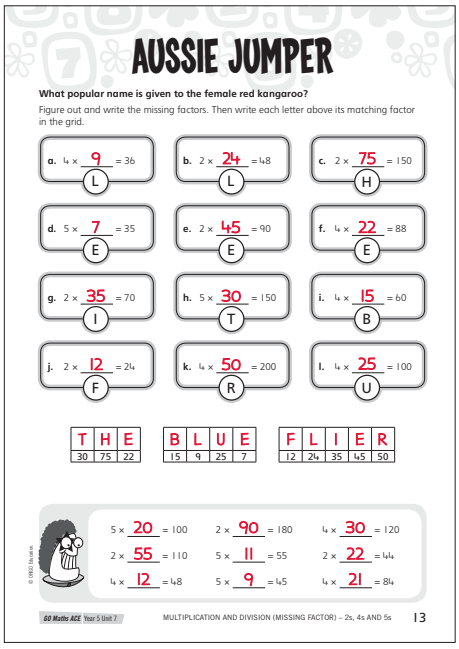
a. 23 × 12 = 276 b. 31 × 11 = 341 c. 22 × 13 = 286

GO Maths ACE Year 5 Unit 8.5 — Write other examples you can solve using the same strategy. — 41

DAILY COMPUTATION PRACTICE

Use page 17 of the *GM ACE* mentals workbook.

Mentals Workbook



AUSSIE JUMPER

What popular name is given to the female red kangaroo?

Figure out and write the missing factors. Then write each letter above its matching factor in the grid.

a. 4 × 9 = 36 (L) b. 2 × 24 = 48 (L) c. 2 × 75 = 150 (H)
d. 5 × 7 = 35 (E) e. 2 × 45 = 90 (E) f. 4 × 22 = 88 (E)
g. 2 × 35 = 70 (I) h. 5 × 30 = 150 (T) i. 4 × 15 = 60 (B)
j. 2 × 12 = 24 (F) k. 4 × 50 = 200 (R) l. 4 × 25 = 100 (U)

T	H	E
30	75	22

B	L	U	E
15	9	25	7

F	L	I	E	R
12	24	35	45	50

5 × 20 = 100 2 × 90 = 180 4 × 30 = 120
2 × 55 = 110 5 × 11 = 55 2 × 22 = 44
4 × 12 = 48 5 × 9 = 45 4 × 21 = 84

GO Maths ACE Year 5 Unit 7 — MULTIPLICATION AND DIVISION (MISSING FACTOR) – 2s, 4s AND 5s — 13

Locating Thousandths on a Number Line

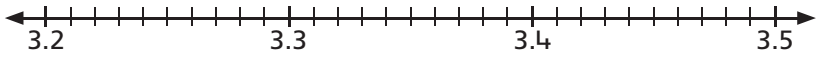
In this lesson, students extend the concept of relative position to decimal fractions involving thousandths.

DAILY NUMBER SENSE

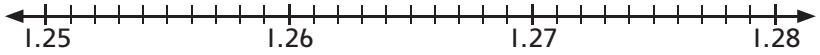
Repeat the Daily Number Sense discussion from the previous lesson with three purses and a price of ***$17.95***.

ACTIVITY

1. On the board, draw the number line shown below. Then draw an arrow to 3.28. Ask: *Where is this arrow pointing? How do you know?* Encourage the students to explain that the tenths have been broken into ten equal parts so each mark must show hundredths. Also bring out the fact that 3.2 is three and two-tenths or three and twenty-hundredths.



2. Repeat Step 1 for other arrows the students draw along this number line.
3. Erase the numbers and relabel the number line as shown below. Ask students to draw different arrows and figure out the values. Encourage them to use the fact that the spaces between the hundredths have been broken into 10 equal parts to represent thousandths.



4. Have the students work independently to complete page 46 of the *GO Maths ACE* student journal. Before the students begin, ask: *How have the number lines been divided? How do you know?*

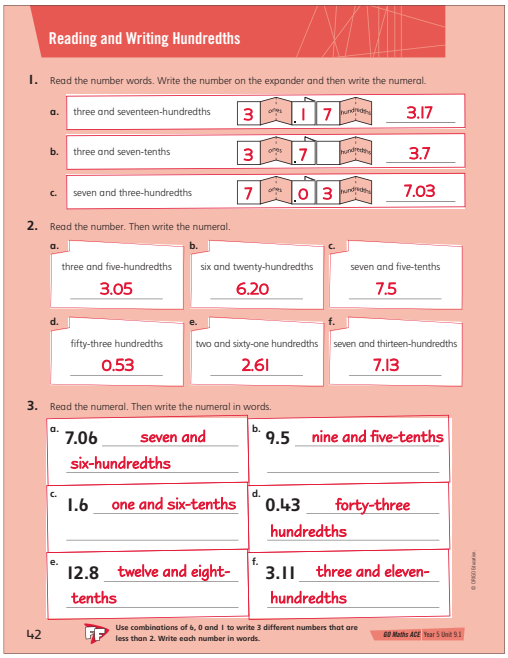
REFLECTION

1. Discuss the strategies the students used to figure out the answers on page 46 of the *GO Maths ACE* student journal, such as 'I thought of one and five-tenths as one and five-hundred thousandths and counted in thousandths'. Then discuss questions such as: *What number did you write that is two-thousandths more than two and six-hundredths?*
2. Ask students to give examples of decimal fractions in the real world with one, two and three decimal places.

MATERIALS

- *GM ACE* student journal, page 46
- *GM ACE* mentals workbook, page 18

Student Journal



Reading and Writing Hundredths

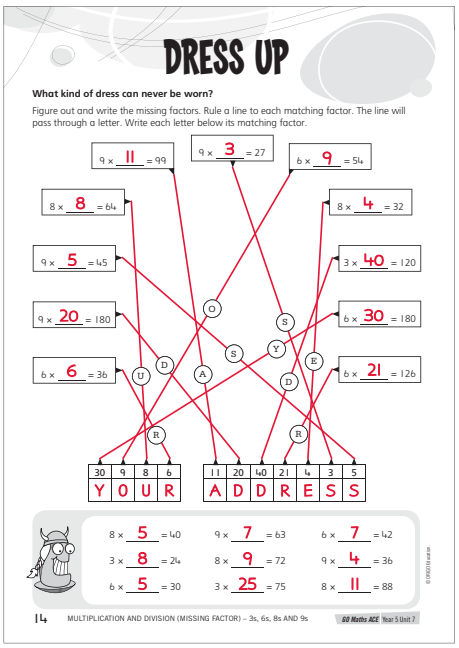
1. Read the number words. Write the number on the expander and then write the numeral.
   a. three and seventeen-hundredths — 3.17
   b. three and seven-tenths — 3.7
   c. seven and three-hundredths — 7.03
2. Read the number. Then write the numeral.
   a. three and five-hundredths: 3.05
   b. six and twenty-hundredths: 6.20
   c. seven and five-tenths: 7.5
   d. fifty-three hundredths: 0.53
   e. two and sixty-one hundredths: 2.61
   f. seven and thirteen-hundredths: 7.13
3. Read the numeral. Then write the numeral in words.
   a. 7.06 seven and six-hundredths
   b. 9.5 nine and five-tenths
   c. 1.6 one and six-tenths
   d. 0.43 forty-three hundredths
   e. 12.8 twelve and eight-tenths
   f. 3.11 three and eleven-hundredths

42 — Use combinations of 6, 0 and 1 to write 3 different numbers that are less than 2. Write each number in words. — GO Maths ACE Year 5 Unit 9.1

DAILY COMPUTATION PRACTICE

Use page 18 of the *GM ACE* mentals workbook.

Mentals Workbook



DRESS UP

What kind of dress can never be worn?

Figure out and write the missing factors. Rule a line to each matching factor. The line will pass through a letter. Write each letter below its matching factor.

9 × 11 = 99 — 9 × 3 = 27 — 6 × 9 = 54
8 × 8 = 64 — 8 × 4 = 32
9 × 5 = 45 — 3 × 40 = 120
9 × 20 = 180 — 6 × 30 = 180
6 × 6 = 36 — 6 × 21 = 126

30	9	8	6
Y	O	U	R

11	20	40	21	4	3	5
A	D	D	R	E	S	S

8 × 5 = 40 — 9 × 7 = 63 — 6 × 7 = 42
3 × 8 = 24 — 8 × 9 = 72 — 9 × 4 = 36
6 × 5 = 30 — 3 × 25 = 75 — 8 × 11 = 88

14 — MULTIPLICATION AND DIVISION (MISSING FACTOR) – 3s, 6s, 8s AND 9s — GO Maths ACE Year 5 Unit 7

UNDERSTANDING | FLUENCY | PROBLEM SOLVING | REASONING