ACE

GO MATHS

TEACHER GUIDE

SAMPLE PAGES

YEAR 6

ORIGO EDUCATION

Adding Fractions with Same or Related Denominators

CONTENT DESCRIPTIONS

NA125 Compare fractions with related denominators and locate and represent them on a number line

NA126 Solve problems involving addition and subtraction of fractions with the same or related denominators

NA127 Find a simple fraction of a quantity where the result is a whole number, with and without digital technologies

MATHEMATICAL BACKGROUND

In the previous year students explored equivalency and begun to add and subtract common fractions that share the same denominator. In this unit, students add common fractions where one denominator is a multiple of the other. A necessary prerequisite for these skills is the ability to find equivalent common fractions. This process is formalised within the unit as students multiply (or divide) the numerator and denominator by the same number to find equivalent fractions. In this case, it is important to use a visual model to show that the two equivalent fractions cover the same area or are equal in length. In this unit, students use both the region (area) and linear (number lines) models to help them find equivalent fractions.

LESSON OVERVIEW

12.1 Finding Fractions of a Quantity

12.2 Adding Fractions – Same Denominators

12.3 Reviewing Equivalency

12.4 Adding Fractions – Related Denominators

12.5 Adding Mixed Numerals – Related Denominators

LANGUAGE

Students will use and develop the following language:
proper fraction, common fraction, improper fraction, mixed numeral, equivalency, numerator, denominator, same denominator, related denominator

MATERIALS

Lesson 12.1
- *GM ACE* student journal, page 54
- 1 copy of Blackline Master 13 for each student

Lesson 12.2
- *GM ACE* student journal, page 55
- *GM ACE* mentals workbook, page 23

Lesson 12.3
- *GM ACE* student journal, page 56
- 3 or 4 copies of Blackline Master 14 for each student
- Blank cards for each student

Lesson 12.4
- *GM ACE* student journal, page 57
- 1 copy of Blackline Master 11 for each group of students

Lesson 12.5
- *GM ACE* student journal, page 58
- *GM ACE* mentals workbook, page 24

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

- NA125
  - A identify fractions with related denominators on a number line
- NA126
  - B add proper fractions and/or mixed numerals with same denominators
  - C add proper fractions and/or mixed numerals with related denominators
- NA127
  - D identify simple fractions of a quantity

TECHNIQUES

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

1. Written Test A B C D

Allow time for the students to complete the written test for Unit 12. Consider administering the test one or two weeks after completion of the unit.

2. Student Journal Page B

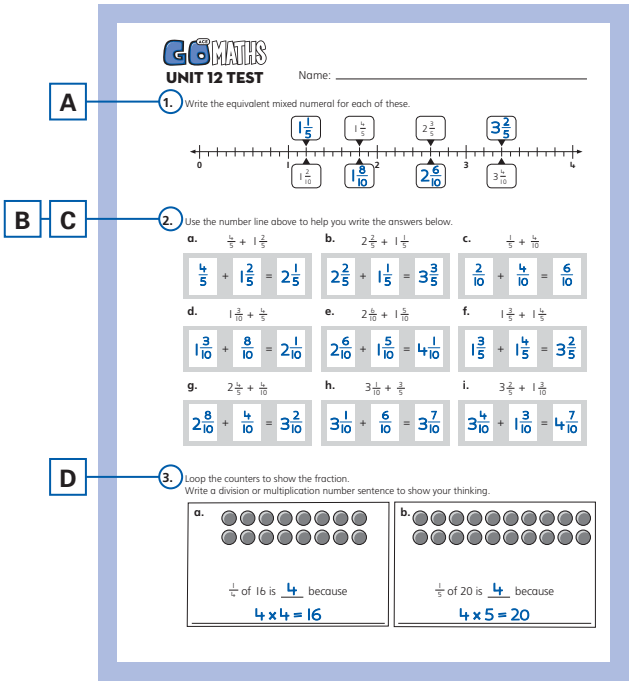
Refer to *GO Maths ACE* student journal page 55.

3. Diagnostic Probe D

Give the student 24 counters. Say: *There are 24 counters in the pile. What is one-quarter of 24? How do you know?*

If successful, ask: *What is two-eighths of 24? How do you know?*

Unit 12 Written Test



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 6	
NA125	12	25
NA126	12	25
NA127	12	

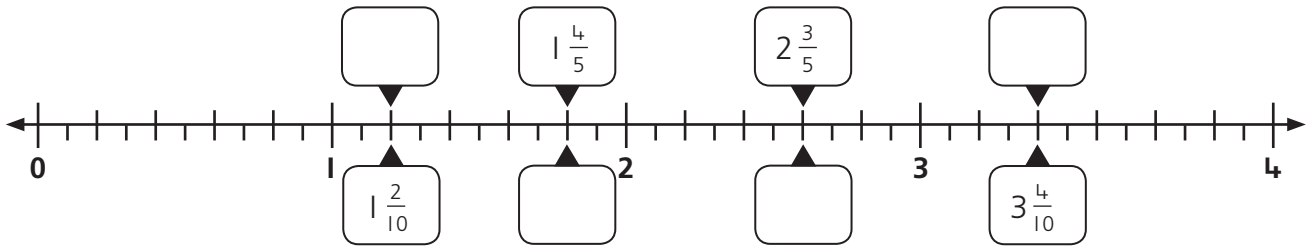
Proficiency Strands

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

GO MATHS ACE
UNIT 12 TEST

Name: _____

1. Write the equivalent mixed numeral for each of these.



2. Use the number line above to help you write the answers below.

a. $\frac{4}{5} + 1\frac{2}{5}$ = ☐ + ☐ = ☐

b. $2\frac{2}{5} + 1\frac{1}{5}$ = ☐ + ☐ = ☐

c. $\frac{1}{5} + \frac{4}{10}$ = ☐ + ☐ = ☐

d. $1\frac{3}{10} + \frac{4}{5}$ = ☐ + ☐ = ☐

e. $2\frac{6}{10} + 1\frac{5}{10}$ = ☐ + ☐ = ☐

f. $1\frac{3}{5} + 1\frac{4}{5}$ = ☐ + ☐ = ☐

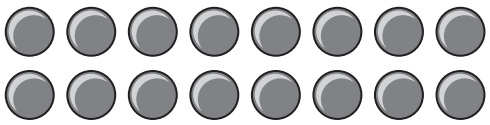
g. $2\frac{4}{5} + \frac{4}{10}$ = ☐ + ☐ = ☐

h. $3\frac{1}{10} + \frac{3}{5}$ = ☐ + ☐ = ☐

i. $3\frac{2}{5} + 1\frac{3}{10}$ = ☐ + ☐ = ☐

3. Loop the counters to show the fraction.
Write a division or multiplication number sentence to show your thinking.

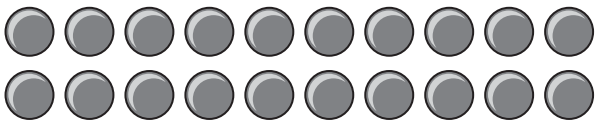
a.



$\frac{1}{4}$ of 16 is ____ because

_____

b.



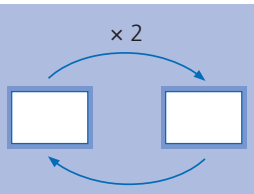
$\frac{1}{5}$ of 20 is ____ because

_____

Finding Fractions of a Quantity

In this lesson, students use the connection between multiplication and division to find a simple fraction of a collection of objects.

DAILY NUMBER SENSE



On the board, draw the function machine shown on the right. Invite volunteers to write pairs of decimal fractions where the output number is between 0 and 1. Encourage them to use numbers with three decimal places. After the volunteers have written several pairs of numbers, ask the students to describe what they notice about the numbers in the first box. (They must be between 0 and 0.5.)

ACTIVITY

1. Distribute Blackline Master 13 and have each student cut out an oblong with three rows. The number in each row can vary. Ask: *How can you work out the total number of squares in your shape?* Invite two or three explanations. Have the students shade one row along a side of the oblong to show one-third of the total. Ask: *What number sentences can we write about the steps that someone might use to describe what you have shaded?* Invite individuals to show their oblongs and write statements on the board that describe what the shading shows, for example:

   $\frac{1}{3}$ ***of 15 is 5*** ***15 ÷ 3 = 5*** ***3 × 5 is 15***

2. Then have the students shade a second row to show a second third of the oblong. Ask questions such as: *What have we done? What could we write about the amount that is shaded?* During this discussion, bring out the fact that each row is one-third so two-thirds of the oblong has been shaded. One-third is 5 and the second third is another 5 so $\frac{2}{3}$ of 15 is 5 + 5 or 10. The students might fold the paper along the rows to show their first shading or one-third of the total. They can open out the oblong to show the second row or two-thirds. In this way they are also showing that they start with one-third and double it to work out two-thirds of the total. On the board write the steps the students describe:

   $\frac{1}{3}$ ***of 15 is 5 so*** $\frac{2}{3}$ ***of 15 is double 5 or 10***

3. Repeat the discussion for $\frac{1}{4}$ and then $\frac{3}{4}$ of an oblong.

4. Discuss the first example in Question 1 to establish the fact that the students find one-fifth of the total first and then triple that number to find three-fifths. Have students work independently or in pairs to complete page 54 of the *GO Maths ACE* student journal.

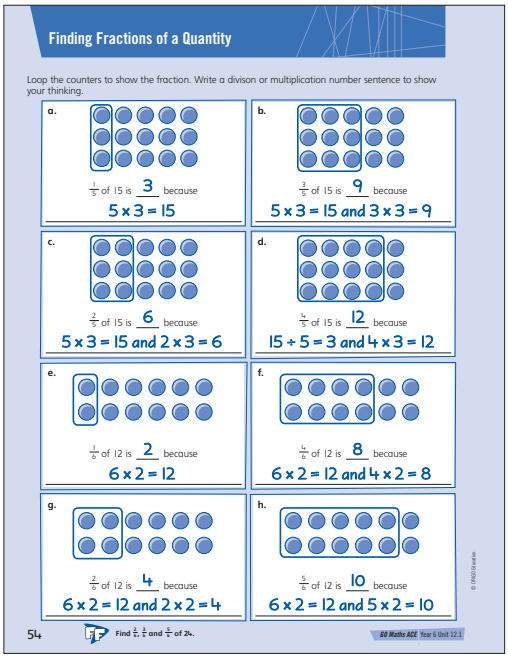
REFLECTION

Discuss the students' answers to page 54 of the *GO Maths ACE* student journal. Discuss the steps the students used for selected examples. Reinforce the steps: Find the unit fraction of the total then multiply to work out the multiple fraction.

MATERIALS

- *GM ACE* student journal, page 54
- 1 copy of Blackline Master 13 for each student

Student Journal



Finding Fractions of a Quantity

Loop the counters to show the fraction. Write a divison or multiplication number sentence to show your thinking.

a. $\frac{1}{3}$ of 15 is 3 because 5 × 3 = 15

b. $\frac{3}{3}$ of 15 is 9 because 5 × 3 = 15 and 3 × 3 = 9

c. $\frac{2}{3}$ of 15 is 6 because 5 × 3 = 15 and 2 × 3 = 6

d. $\frac{4}{5}$ of 15 is 12 because 15 ÷ 5 = 3 and 4 × 3 = 12

e. $\frac{1}{6}$ of 12 is 2 because 6 × 2 = 12

f. $\frac{4}{6}$ of 12 is 8 because 6 × 2 = 12 and 4 × 2 = 8

g. $\frac{2}{6}$ of 12 is 4 because 6 × 2 = 12 and 2 × 2 = 4

h. $\frac{5}{6}$ of 12 is 10 because 6 × 2 = 12 and 5 × 2 = 10

54 Find $\frac{2}{5}$, $\frac{3}{5}$ and $\frac{5}{5}$ of 24. GO Maths ACE Year 6 Unit 12.1

DAILY COMPUTATION PRACTICE

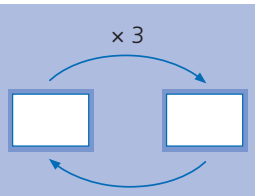
Write the following number sentences on the board. Have the students write the answers.

5 × $1.99 = ___	*$2.98 × 5 = ___*
4 × $2.99 = ___	*$2.99 × 6 = ___*
3 × $1.98 = ___	*$3.97 × 3 = ___*
$1.99 × 4 = ___	*$2.98 × 4 = ___*
2 × $8.97 = ___	*5 × $1.97 = ___*
8 × $1.99 = ___	*6 × $1.97 = ___*

Adding Fractions – Same Denominators

This lesson reviews the addition of common fractions that share the same denominator.

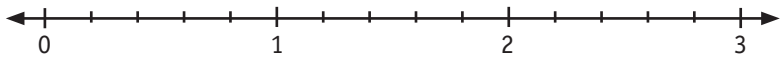
DAILY NUMBER SENSE



Repeat the Daily Number Sense discussion from the previous lesson for the function machine shown on the right. The output number should be less than 1. After the volunteers have written several pairs of numbers, ask the students to describe what they notice about the numbers in the first box. (They must be between 0 and 0.333.)

ACTIVITY

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



   Ask: *What fractions can we write at each of the marks on this number line? How do you know?* Invite volunteers to write a fraction or mixed numeral (in fifths) at each mark.

2. Write the first number sentence shown below on the board. Review what the students know about adding fractions with same denominator. Ask, *How can you use the number line to figure out the total?* Invite a confident volunteer to come to the front and share their solution. Write the answer and repeat for the other number sentences.

   $\frac{2}{5} + \frac{3}{5} =$ ____ $\frac{4}{5} + \frac{4}{5} =$ ____ $\frac{3}{5} + 1\frac{4}{5} =$ ___ $1\frac{1}{5} + 1\frac{2}{5} =$ ___

3. Discuss the final number sentence above. Ask, *Who can add these mixed numerals without using the number line?* Invite confident students to share their strategies e.g. adding the two whole numbers then adding the two fractions. If a breaking-up strategy is suggested challenge the students to apply the same strategy to the third example above. This example is more difficult because students are forced to add an improper fraction to the whole number. Encourage successful students to share their solutions.

4. Have the students work independently to complete page 55 of the *GO Maths ACE* student journal.

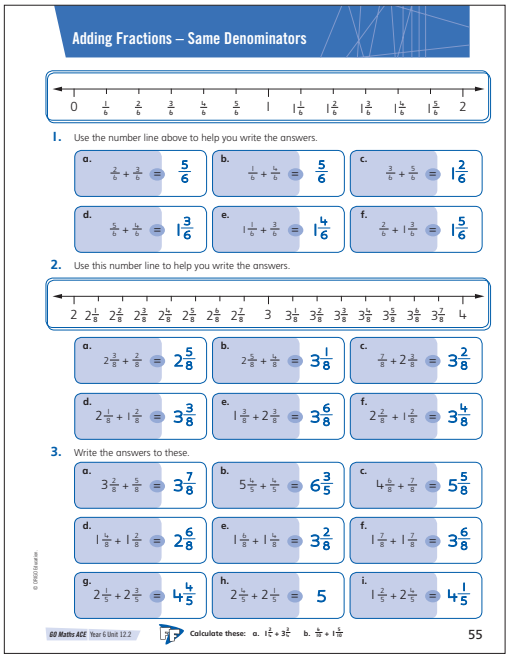
Reflection

Discuss the students' answers to page 55 of the *GO Maths ACE* student journal. Ask the students to identify the mixed numerals that they were able to add mentally without the aid of a number line.

MATERIALS

- *GM ACE* student journal, page 55
- *GM ACE* mentals workbook, page 23

Student Journal


Adding Fractions – Same Denominators

0 1/6 2/6 3/6 4/6 5/6 1 1 1/6 1 2/6 1 3/6 1 4/6 1 5/6 2

1. Use the number line above to help you write the answers.

a. 2/6 + 3/6 = 5/6 b. 1/6 + 4/6 = 5/6 c. 3/6 + 5/6 = 1 2/6

d. 5/6 + 4/6 = 1 3/6 e. 1 1/6 + 3/6 = 1 4/6 f. 2/6 + 1 3/6 = 1 5/6

2. Use this number line to help you write the answers.

2 2 1/8 2 2/8 2 3/8 2 4/8 2 5/8 2 6/8 2 7/8 3 3 1/8 3 2/8 3 3/8 3 4/8 3 5/8 3 6/8 3 7/8 4

a. 2 3/8 + 2/8 = 2 5/8 b. 2 5/8 + 4/8 = 3 1/8 c. 7/8 + 2 3/8 = 3 2/8

d. 2 1/8 + 1 2/8 = 3 3/8 e. 1 3/8 + 2 3/8 = 3 6/8 f. 2 2/8 + 1 2/8 = 3 4/8

3. Write the answers to these.

a. 3 2/8 + 5/8 = 3 7/8 b. 5 1/5 + 1/5 = 6 3/5 c. 4 4/8 + 7/8 = 5 5/8

d. 1 1/8 + 1 2/8 = 2 6/8 e. 1 4/8 + 1 1/8 = 3 2/8 f. 1 7/8 + 1 7/8 = 3 6/8

g. 2 1/5 + 2 3/5 = 4 4/5 h. 2 2/5 + 2 1/5 = 5 i. 1 3/5 + 2 2/5 = 4 1/5

GO Maths ACE Year 6 Unit 12.2 Calculate these: a. 1 2/5 + 3 1/5 b. 3/4 + 1 3/4 55

DAILY COMPUTATION PRACTICE

Use page 23 of the *GM ACE* mentals workbook.

Mentals Workbook

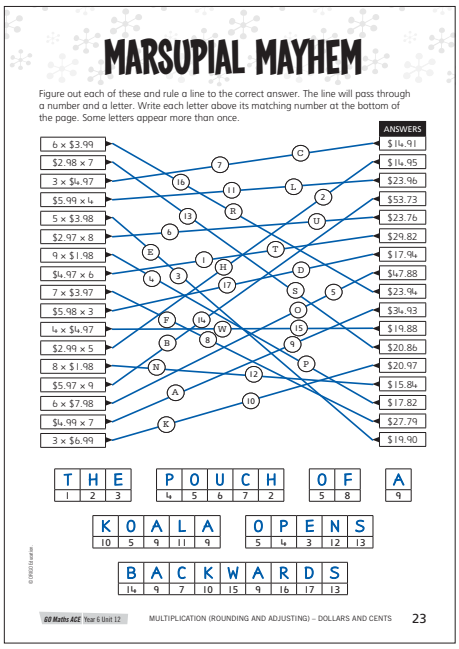

MARSUPIAL MAYHEM

Figure out each of these and rule a line to the correct answer. The line will pass through a number and a letter. Write each letter above its matching number at the bottom of the page. Some letters appear more than once.

ANSWERS

6 × $3.99 — $14.91
$2.98 × 7 — $14.95
3 × $4.97 — $23.96
$5.99 × 4 — $53.73
5 × $3.98 — $23.76
$2.97 × 8 — $29.82
9 × $1.98 — $17.94
$4.97 × 6 — $47.88
7 × $3.97 — $23.94
$5.98 × 3 — $34.93
4 × $4.97 — $19.88
$2.99 × 5 — $20.86
8 × $1.98 — $20.97
$5.97 × 9 — $15.84
6 × $7.98 — $17.82
$4.99 × 7 — $27.79
3 × $6.99 — $19.90

T	H	E
1	2	3

P	O	U	C	H
4	5	6	7	2

O	F
5	8

A
9

K	O	A	L	A
10	5	9	11	9

O	P	E	N	S
5	4	3	12	13

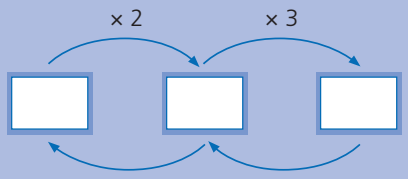
B	A	C	K	W	A	R	D	S
14	9	7	10	15	9	16	17	13

GO Maths ACE Year 6 Unit 12 MULTIPLICATION (ROUNDING AND ADJUSTING) – DOLLARS AND CENTS 23

Reviewing Equivalency

In this lesson, students use a region model to help them formalise the rules for finding equivalent fractions.

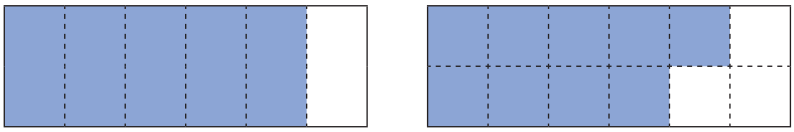
DAILY NUMBER SENSE



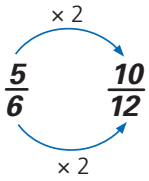
On the board, draw the diagram on the right. Invite volunteers to give a number for the first box and then use the rules to figure out the number in the last box. All the numbers should have three digits and be between 0 and 10 (e.g. 1.23, 2.45). Swap the rules on the arrows and continue the discussion. Reinforce the concept that order is not important when both rules involve multiplication.

ACTIVITY

1. On the board, draw two pictures of identical rectangular-sized cakes. Divide the cakes into sixths and twelfths and shade $\frac{5}{6}$ of the first cake (as shown below left) and $\frac{9}{12}$ of the second cake (shown below right). Without reference to the fractions shown, ask: *Which cake has the greater amount shaded? How do you know?* Encourage individuals to make estimates, using fraction names they suggest. Bring out the fact that the comparison cannot be made exactly unless both of the whole cakes were cut into the same size slices (that is, both can be expressed as fractions with the same denominator).



2. Ask students to describe how they can 'convert' one fraction to the other. Invite a student to draw a line(s) on the cake showing sixths into twelve equal slices. Ask: *How did the total number of parts change? How did the number of parts we shaded change? Did the amount of cake we shaded change?* (The number of pieces doubled, but the amount of cake did not increase.) On the board, draw the fractions shown on the right and use arrows to reinforce that the numerator and denominator were changed in the same way. Use this picture to verify that $\frac{5}{6}$ expressed in twelfths is greater than $\frac{9}{12}$.



3. Work with the class to complete Question 1a on page 56 of the *GO Maths ACE* student journal.
4. Then have students work independently to complete the page.

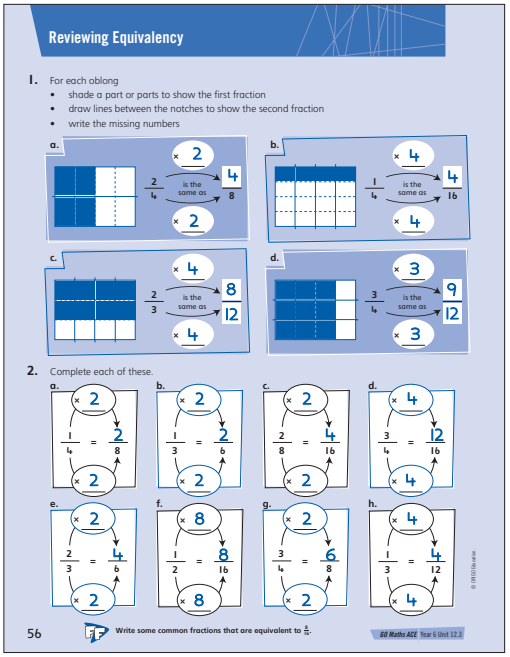
REFLECTION

Discuss the students' answers to page 56 of the *GO Maths ACE* student journal. For each example ask the students to describe how they figured out the number they used to multiply the first fraction to find the second fraction. Reinforce the concept that the form of the fractions has changed, but the amount each fraction represents has not.

MATERIALS

- *GM ACE* student journal, page 56
  - 3 or 4 copies of Blackline Master 14 for each student
  - Blank cards for each student

Student Journal



DAILY COMPUTATION PRACTICE

Write the following number sentences on the board. Have the students write the answers.

4 × $1.49 = ___ *$1.49 × 5 = ___*
2 × $2.49 = ___ *$3.48 × 4 = ___*
3 × $1.48 = ___ *$3.49 × 3 = ___*
$1.49 × 5 = ___ *$6.48 × 2 = ___*
2 × $3.47 = ___ *5 × $3.49 = ___*
5 × $2.48 = ___ *6 × $1.49 = ___*

CONSOLIDATION

Have students make a set of fraction cards to show all possible fractions with 2, 3, 4, 6 or 12 as the denominator. Each fraction should be shown as a picture (using Blackline Master 14) and also written in symbol form. Once completed, have the students play mix-and-match games.

Adding Fractions – Related Denominators

In this lesson, students must decide how they will divide the region before they add or subtract. They use equivalent fractions to add and subtract fractions when one denominator is a multiple of the other.

DAILY NUMBER SENSE

Use the diagram from the previous Daily Number Sense discussion. Write ***3.25*** in the first box and have the students figure out the numbers in the other boxes. Repeat for ***4.25*** and then ***5.25*** in the first box and write the numbers one under the other as shown below.

3.25	6.5	19.5
4.25	8.5	25.5
5.25	10.5	31.5

Ask: *How did the input numbers change?* (Increased by 1.) *How did the second output numbers change?* (Increased by 6.) Repeat for other sets of input numbers related in the same way.

ACTIVITY

1. Have the students move into groups and give each group a copy of Blackline Master 14. On the board, write the number sentence $\frac{1}{6} + \frac{1}{3} =$ ___ and ask: *How will we add these fractions? Which fraction do you think can be expressed another way? Which new fraction is equivalent to that fraction?* Encourage students to explain that one-third can be expressed as sixths. Ask the groups to rule lines on one of the oblongs on their copy of Blackline Master 14 to show how they can figure out the answer (as shown on the right).
2. Invite volunteers to describe the steps they used to figure out how to show the fractions. Write the new number sentence $\frac{1}{6} + \frac{2}{6} = \frac{3}{6}$ under the first example to show that $\frac{1}{3}$ was changed to $\frac{2}{6}$ to add. It is not necessary to simplify the answer. Note that students can shade the fractions in any way they choose because it is only necessary to count the number of shaded sixths to determine the answer.
3. Repeat Steps 1 and 2 for the following number sentences. Have the students write the new number sentences.

$\frac{5}{12} + \frac{1}{3} =$ ____ $\quad \frac{2}{3} - \frac{1}{6} =$ ____ $\quad \frac{7}{12} - \frac{1}{2} =$ ____

4. Have the students work independently to complete page 57 of the *GO Maths ACE* student journal.

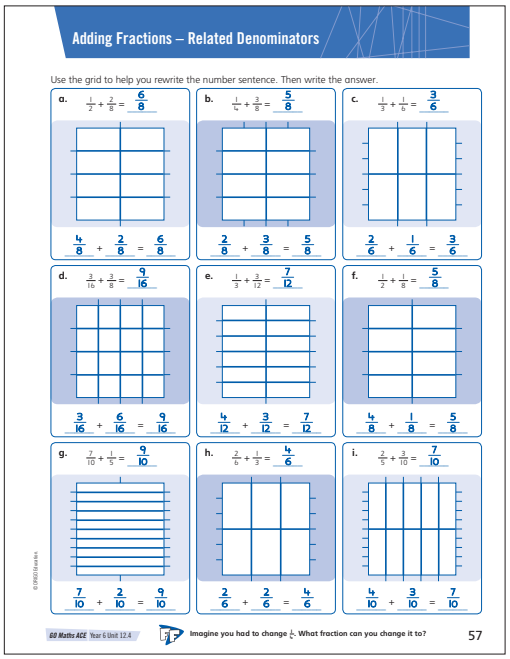
REFLECTION

1. Discuss the students' answers to page 57 of the *GO Maths ACE* student journal.
2. Discuss the need to use equivalent fractions when adding and subtracting fractions.

MATERIALS

- *GM ACE* student journal, page 57
- 1 copy of Blackline Master 11 for each group of students

Student Journal



DAILY COMPUTATION PRACTICE

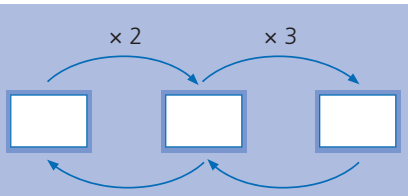
Write the following number sentences on the board. Have the students write the answers.

6 × $1.49 = ___	*$1.49 × 9 = ___*
5 × $2.49 = ___	*$3.48 × 5 = ___*
8 × $1.48 = ___	*$3.49 × 6 = ___*
$1.49 × 7 = ___	*$6.45 × 2 = ___*
4 × $3.47 = ___	*5 × $3.46 = ___*
7 × $2.48 = ___	*7 × $3.47 = ___*

Adding Mixed Numerals – Related Denominators

This lesson extends the addition of fractions with related denominators to examples that involve mixed numerals.

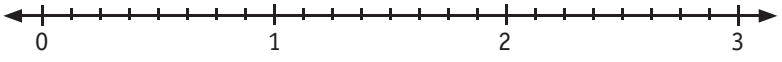
DAILY NUMBER SENSE



On the board, draw the diagram shown on the right. Invite volunteers to give a number for the last box and then use the rules to figure out the number in the first box. All the numbers should have three or more digits and be between 0 and 10 (e.g. 7.05). During this discussion, encourage the students to relate the steps to working back from the circumference to the diameter and then to the radius.

ACTIVITY

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



   Ask: *What fractions can we write at each of the marks on this number line? How do you know?* Invite volunteers to write a fraction or mixed numeral (in eighths) at each mark.

2. Say: *Imagine you are given five minutes to walk or run as far as you can around the oval, going beyond one lap if possible. Flags will mark every one-eighth of a lap and distances recorded to the nearest eighth. A student might walk $1\frac{1}{2}$ laps in five minutes and then run $2\frac{1}{4}$ laps in five minutes.* Now refer to the number line on the board and say: *Choose two distances that you might walk or run. How could you work out the total?* Invite volunteers to give two lengths, using halves, quarters or eighths to describe the distances in laps. Have members of the group describe how to work out the answer. Encourage the students to suggest both improper fraction or mixed numeral forms. Repeat for another pair of distances as time allows.

3. Say: *Imagine the distances between stops in a road rally are reported in fractions of an hour: $1\frac{1}{4}$ hours, $1\frac{1}{2}$ hours, $1\frac{3}{4}$ hours and so on. The drivers are working out the total time for two sections of the rally – $1\frac{3}{4}$ hours plus $1\frac{1}{2}$ hours.* Have the students work independently to determine the total time and then explain their thinking using improper fraction or mixed numeral forms.

4. Have the students work independently to complete the page 58 of the *GO Maths ACE* student journal.

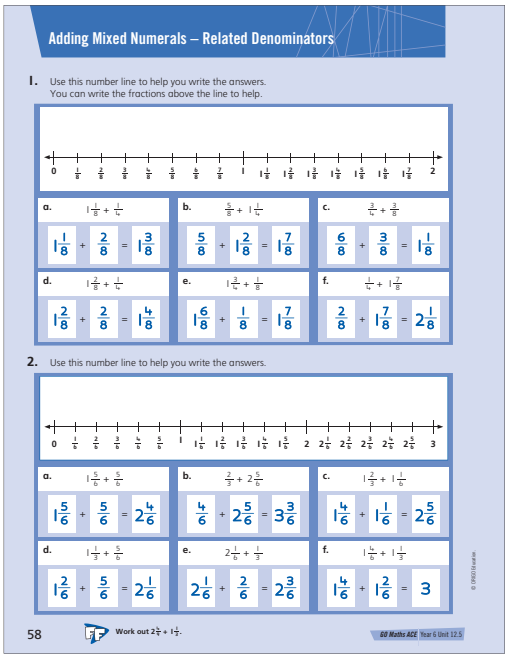
REFLECTION

Discuss the students' answers to page 58 of the *GO Maths ACE* student journal. Ask the students to describe how they decided which fraction (if any) had to be rewritten to work out the answer.

MATERIALS

- *GM ACE* student journal, page 58
- *GM ACE* mentals workbook, page 24

Student Journal


Adding Mixed Numerals – Related Denominators

1. Use this number line to help you write the answers. You can write the fractions above the line to help.

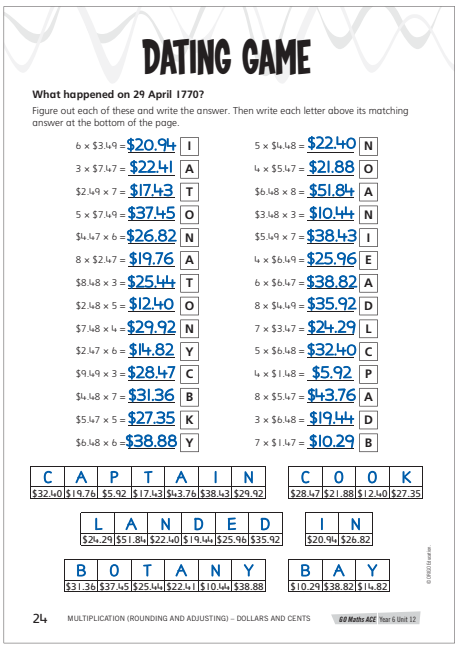
2. Use this number line to help you write the answers.

58

DAILY COMPUTATION PRACTICE

Use page 24 of *GM ACE* mentals workbook.

Mentals Workbook


DATING GAME

What happened on 29 April 1770?

Figure out each of these and write the answer. Then write each letter above its matching answer at the bottom of the page.

6 × $3.49 = $20.94	I	5 × $4.48 = $22.40	N
3 × $7.47 = $22.41	A	4 × $5.47 = $21.88	O
$2.49 × 7 = $17.43	T	$6.48 × 8 = $51.84	A
5 × $7.49 = $37.45	O	$3.48 × 3 = $10.44	N
$4.47 × 6 = $26.82	N	$5.49 × 7 = $38.43	I
8 × $2.47 = $19.76	A	4 × $6.49 = $25.96	E
$8.48 × 3 = $25.44	T	6 × $6.47 = $38.82	A
$2.48 × 5 = $12.40	O	8 × $4.49 = $35.92	D
$7.48 × 4 = $29.92	N	7 × $3.47 = $24.29	L
$2.47 × 6 = $14.82	Y	5 × $6.48 = $32.40	C
$9.49 × 3 = $28.47	C	4 × $1.48 = $5.92	P
$4.48 × 7 = $31.36	B	8 × $5.47 = $43.76	A
$5.47 × 5 = $27.35	K	3 × $6.48 = $19.44	D
$6.48 × 6 = $38.88	Y	7 × $1.47 = $10.29	B

C	A	P	T	A	I	N
$32.40	$19.76	$5.92	$17.43	$43.76	$38.43	$29.92

C	O	O	K			
$28.47	$21.88	$12.40	$27.35			

L	A	N	D	E	D	
$24.29	$51.84	$22.40	$19.44	$25.96	$35.92	

I	N
$20.94	$26.82

B	O	T	A	N	Y	
$31.36	$37.45	$25.44	$22.41	$10.44	$38.88	

B	A	Y
$10.29	$38.82	$14.82

24 MULTIPLICATION (ROUNDING AND ADJUSTING) – DOLLARS AND CENTS

UNDERSTANDING | FLUENCY | PROBLEM SOLVING | REASONING