Materials

Materials

- Counters
- Index cards
- Linking cubes

Optional

- Cards for multiplication and division facts for 2, 3, 4, and 5 without answers on the back

Printouts

(singaporemath.com/higprintouts)

- Array Dot Cards
- Divide Game Board
- Multiplication Chart 3
- Multiplication Chart 4
- Multiplication Charts 2B
- Multiplication Squares 2-3-4-5 Game Board
- Multiply 2-3-4-5 Game Board

Mental Math Sheets

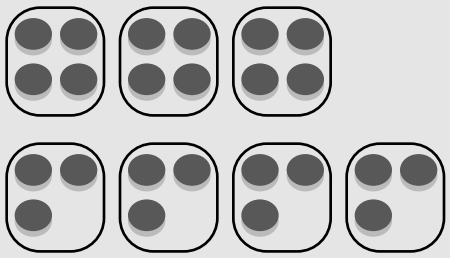
(singaporemath.com/higprintouts)

Mental Math		After Lesson
16	Multiplication and division facts for 2, 5, 10	(review)
17	Multiplication and division facts for 2, 5, 10	(review)
18	Multiplication facts for 3	2
19	Division facts for 3	3
20	Multiplication and division facts for 3	4
21	Multiplication and division facts for 2, 3, 5, and 10	4
22	Multiplication facts for 4	6
23	Division facts for 4	7
24	Multiplication and division facts for 4	8
25	Multiplication and division facts for 2, 3,4, 5, and 10	8
26	Multiplication and division facts for 2, 3, 4, 5, and 10	8
27	Multiplication and division facts for 2, 3, 4, 5, and 10	8

Notes

In this chapter, students will study and begin to commit the multiplication (and division) facts for 3 and 4 to memory. They learned the concept of multiplication and division, as well as the multiplication and division facts for 2, 5, and 10, in Dimensions Math® 2A.

At this level, the order of the numbers in the multiplication expression in the textbook will follow the order common in the U.S. The expression 3 × 4 means 3 groups of 4, or 3 "times" 4. This order is entirely arbitrary. The symbol could be and is often interpreted as "multiply by," where 3 × 4 means 3 in a group multiplied by 4. However, consistency in the order of the factors is useful initially since students do need to understand that 3 × 4 = 4 × 3 means that 3 groups of 4 have the same answer as 4 groups of 3.



3 × 4 = 4 × 3
3 times 4 = 4 times 3
3 groups of 4 = 4 groups of 3

Because students have already learned this, do not require them to write the factors in a specific order when they write equations for word problems.

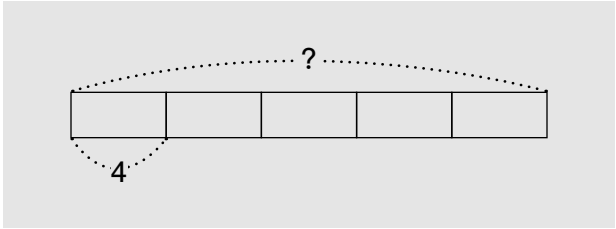
This curriculum does not emphasize "skip counting" and using fingers to keep track of how many times they have "skip counted" as the primary means to mentally calculate multiplication facts before they are memorized. Students learn various strategies for finding unknown facts from known facts. For example, if they already know that 5 × 4 is 20, then 6 × 4 is 4 more than that, 24. Or, if they know 10 × 4 is 40, then 9 × 4 is 4 less than that, 36. Or, 8 × 4 is double double 8 (8 × 2 × 2, or 16 + 16).

Since they already understand, for example, that 4 × 6 = 6 × 4, by the end of this chapter they will have learned all of the 100 multiplication facts through 10 × 10, except for 16 of them (the ones where both factors are greater than 5). They will learn the remaining facts (and their accompanying division facts) in Dimensions Math® 3B.

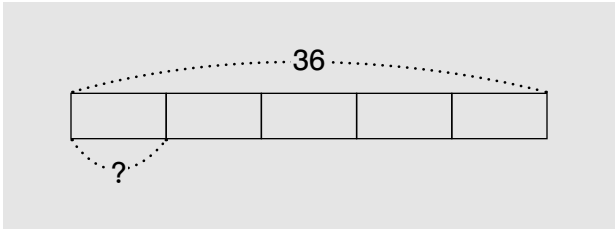
In Dimensions Math® 2A, in the very last lesson of Chapter 7, students saw three types of bar models that you could draw to help your student interpret whether a word problem that involves equal groups should be solved with multiplication or with division. They are not used in this chapter since the word problems are usually one-step problems, and students should be able to interpret them easily. This level of interpretation is needed to draw the bar model anyway. However, if your student is still having trouble interpreting the problems, you can draw a bar model for them. Alternately, let your student use counters or make simple drawings to "act out" the

problem. The usefulness of bar models as a problem solving tool will become more evident in later levels of the Dimensions Math® curriculum, and students will be more capable of using them as such.

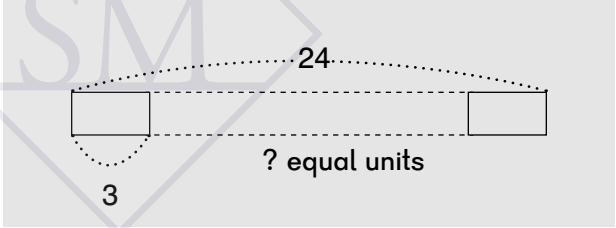
The model below shows that we know that we have 5 equal groups of 4 and need to find the total: 5 × 4 = ?



The model below shows a "sharing" division situation. We know that we have a total of 36 and 4 equal groups and need to find the quantity in each group: 36 ÷ 4 = ?



The model below shows a "grouping" division situation. We know that we have a total of 24 and a quantity of 3 in each group and need to find the number of groups: 24 ÷ 3 = ?



Fact Practice

The more "fluent" your student is with the multiplication and division facts, the easier it will be for them to learn the multiplication and division algorithm in Dimensions Math® 3A, and the easier it will also be to estimate, which is essential for the division algorithm. Include fact practice at other times than just in the lesson that tells students to learn them; knowing them well enough to recall them easily is an ongoing endeavor. This guide will not tell you how many problems your student should be able to do in a set amount of time. Some students who are very good with math concepts and have a deep understanding of math, as well as an ability to see patterns and solve problems, have trouble with memorizing all of the math facts. They can be good at calculating unknown facts from known facts quickly, but never achieve some arbitrary speed. Don't judge math ability as synonymous with fact recall ability.

A few general activities and games are provided here to help your student learn the facts for 3 and 4 and review the ones for 2 and 5. You can also use the **Mental Math Sheets**, the **Multiplication Charts 2B** printout, or find online games where you can specify which facts are included in the game, particularly games that encourage answering quickly. However you provide practice, be sure to keep it fun and light for your student, not frustrating and tedious.

Activity

- At any time
  Materials: Flash cards for the facts being practiced
  Purpose: Recall multiplication or division facts.
  Procedure: Mix the cards up. Show your student one card at a time and have them give the answer. If correct, place them in one pile; if wrong, place them in a second pile. Repeat with the second pile.

Games

- After Lesson 6 for multiplication, Lesson 7 for division
  Materials: **Multiply 2-3-4-5 Game Board** or **Divide Game Board** printout, counters (a different color for each player), fact cards without answers on the back
  Purpose: Practice multiplication or division facts.
  Goal: Get five in a row.
  Procedure: Shuffle the fact cards and turn them face down. Players take turns drawing a card. They put a counter on the answer on the board. If all the answers are covered, the player loses their turn. (Alternately, allow that player to draw another card.)The player first to get five counters in a row on the board wins. On the division board, a star can be part of their 5 in a row.

- After Lesson 7
  Materials: **Multiplication Squares 2-3-4-5 Game Board** printout, markers or crayons (a different color for each player), fact cards without answers on the back
  Purpose: Practice multiplication facts.
  Goal: Get the most shaded squares.
  Procedure: Shuffle the fact cards and turn them face down. Players take turns drawing a card. They then trace the one edge of a square that has the answer. Once a player has traced all four edges of one square, they can color it in. Play continues until all square are shaded in. The player with the most squares shaded wins.
  Variation: Play continues until the first player has colored in a predetermined number of squares. (This allows for a shorter game.)

Lesson 1 The Multiplication Table of 3 (pp. 24–26)

Think (p. 24)

Your student should understand that the blank box is to be filled with the different values, and then the answer will change depending on the value in the box.

Use the **Multiplication Chart 3** printout and, optionally, linking cubes. Have your student form one train of 3 cubes for the trees in 1 planter, write the total and an equation on the chart, then make another train of 3 cubes, and so on. If they mastered Dimensions Math® 2A, they may not need to make the trains. They should see that the total number of trees increases by 3 when the number of planters increases by 1.

Learn (p. 25)

Students learned the term "product" in Dimensions Math® 2A. They should realize that the product for each row is the total counters for all the rows before as well as the counters in that row. Ask your student if there are any multiplication facts for 3 they already know. They should know at least 5 × 3, 2 × 3, and 10 × 3 from Dimensions Math® 2A.

Ask your student to add the digits of the answers. Alex is showing what they need to do. They will find that the sum of the digits is always 3, 6, or 9. They can use this idea to quickly check their multiplication facts. For example, 26 cannot be a correct answer. (In later levels, students will learn that the sum of the digits of all multiples of 3 is a multiple of 3.)

Answers

3 × 3 is **3** more than 2 × 3.
4 × 5 is **3** less than 5 × 3.
7 × 3 is 3 more than **6** × 3.
9 × 3 is 3 less than **10** × 3.

❷ (a) 6 (b) 12

❸ (a) 15 (b) 30
18 27
21 24

❹ 9 × 3 = 27
27

Do (p. 26)

❶ Even though students do not skip count to find the answers to multiplication facts, counting by threes will help them recognize multiples of 3.

❷ Students may notice that 4 × 3 is double 2 × 3. You can point out that 8 × 3 is double 4 × 3 (12 + 12), and use the linking cubes to show this visually.

❸ You can use the appropriate cards from the **Array Dot Cards** printout and have students cover up rows with an index card to show the first problem in each set (no rows are covered for 10 × 3), and then slide it down one row at a time for (a), or up one row at a time for (b). This problem just affirms the concept in Learn.

❹ This is one of the multiplication problems from the Chapter Opener.

Lesson 2 Multiplication Facts of 3 (pp. 27–29)

Think (p. 27)

Your student may realize from Dimensions Math® 2A that the rolls are arranged in an array, and know that either the rows or the columns in an array can be considered the group. We can write either 3 × 4 or 4 × 3 when following the accepted interpretation of "times" or "groups of" for the multiplication symbol. The answer will be the same. However, you can accept any answer. Your student might even say we could multiply 6 by 2. You can then discuss in Learn what equations are expected when objects are arranged in rows and columns as an array.

Learn (p. 27)

This confirms that we can think of this arrangement as 3 groups of 4 (3 × 4) or 4 groups of 3 (4 × 3). Whichever way we think of it, the total is the same. So if we know the answer for some number times 4, then we also know the answer to 4 times that same number.

Answers

12 12 12 12
12

❶ 18 18
18 18

❷ (a) 3 (b) 3
(c) 9 (d) 5

❸ 2 more of the 6-gram weights

❹ 3 × 3 = 9
9

Do (pp. 28–29)

❷ Students should realize they do not have to find the answer to the multiplication expression to know what number goes in the blank.

❸ Students should be able to find the answer without having to determine the total weight on the left hand side of the balance. There are six 3-gram weights, which has the same weight as three 6-gram weights.

❹ You can have your student make their own cards using index cards, or use purchased fact cards.

Include practice with any facts for 2, 5, or 10 your student still needs to learn.

Lesson 3 Dividing by 3 (pp. 30–32)

You may want to allow an extra day to practice math facts and to do the workbook exercise.

Think (p. 30)

Have your student use counters (or crayons if you have 48 of them) and paper pates or cups, and do these two activities.

Learn (p. 30–31)

The first situation is a "sharing" situation; the given total items are shared into a given number of equal groups and we need to find out how many are in each group. Page 30 reminds students that we can think of the multiplication fact for 3 groups that gives an answer of 24 to find the answer to 24 ÷ 3, which is the number in each group.

The second situation is a "grouping" situation; the given total items are grouped by a given number and we need to find how many equal groups are formed. Page 31 reminds students that we can think of the multiplication fact for 3 in each group that gives 24 to find the answer to 24 ÷ 3, which is the number of groups.

The numerical value of the answer is the same. It does not matter which fact students think of (3 × 8 = 24 or 8 × 3 = 24) for either of these situations.

You can prepare fact cards for division by 3 and include division facts in ongoing fact practice.

Answers

(a) 8 8
8

(b) 8 8
8

❶ (a) 6
6

(b) 6
6

❷ (a) 5
5

(b) 9
9

❸ (a) 7 (b) 4 (c) 2
(d) 10 (e) 3 (f) 8

Do (p. 32)

❶ This essentially repeats Learn using different numbers. Students are expected to use counters in order to have the concrete to pictorial progression with the three problems.

Lesson 4 Practice A (p. 33)

This practice is short but the workbook exercise is long, and includes a review of addition and subtraction, as well as multiplication and division by 2, 5, and 10.

❸ ❹ Ask your student to write an expression and then find the answer. The factors can be in any order. Have your student either write the answer in a sentence or write the answer on a separate line, perhaps circled, and include the unit (either the measurement unit or the name of the objects).

Enrichment

- Students should know that not every given number can be divided equally by another given number. They encountered a few problems in Dimensions Math® 2A where there was a remainder, and will also encounter a few in the Challenge section of the workbook and in the last problem of some of the practices. They need to understand that when they do have a division problem with a remainder, they have to have either shared as many objects into equal groups that they can, or made as many equal groups as they can. The remainder therefore is always less than the number they are dividing by. There will be more formal lessons on remainders in Dimensions Math® 3A.

  If time permits, you can investigate remainders for division by 3. Your student should know all the multiples of 3 to 30.

Answers

❶ (a) 12 (b) 15 (c) 6
(d) 30 (e) 27 (f) 21
(g) 3 (h) 1 (i) 6

❷ (a) 2 (b) 8 (c) 5
(d) 9 (e) 3 (f) 7
(g) 6 (h) 10 (i) 4

❸ $3 \times 8 = 24$
$24

❹ (a) $9 \div 3 = 3$
3 bags
(b) $3 \times 10 = 30$
30 balloons

Give your student 23 counters and ask them to divide as many as possible into 3 equal groups. There will be 7 in each group, with 2 left over. Ask them how they could find the answer without counters. They would have to think of the multiplication (or division) fact where the whole is as close as possible to 23 but less than 23: $3 \times 7 = 21$. The remainder is then $23 - 21 = 2$.

You can ask your student to find the answer and the remainder for other numbers within 30 when divided by 3. Point out that the remainder will always be less than 3. Do not ask them to write equations.

Chapter 9 Workbook Answers

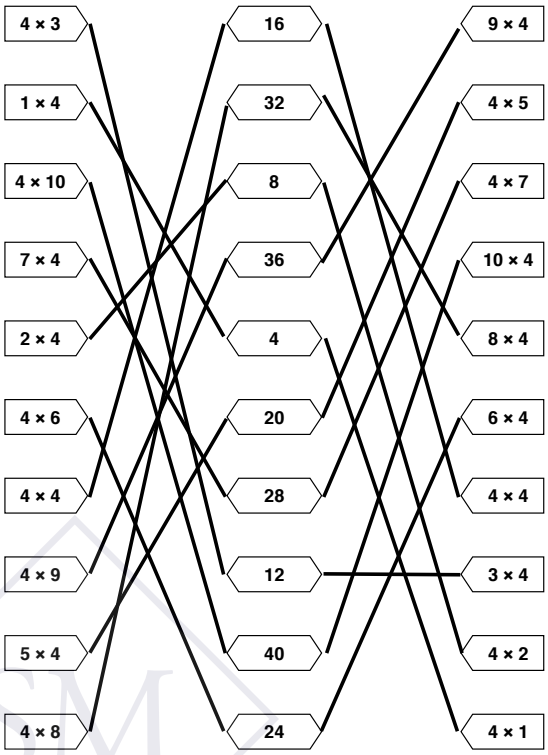
Exercise 6 pp. 41–42

❶ 32
32

❷ (a) 12 12
(b) 24 24
(c) 20 20
(d) 8 8
(e) 28 28
(f) 40 40
(g) 36 36
(h) 16

❸ 4 × 6 = 24
24

❹



Exercise 7 pp. 43–46

❶ (a) 8 8
8
(b) 8 8
8

❷ (a) 6 × 4 = 24
24
(b) 24 ÷ 4 = 6
6

❸ 3 8
3 8

1 4
1 4

6 9
6 9

2 7
2 7

5 10
5 10

❹ (a) 16 (b) 36
(c) 28 (d) 20
(e) 24 (f) 32

❺ 40 ÷ 4 = 10
10

❻ 16 ÷ 4 = 4
4

❼ 28 ÷ 4 = 7
7

Chapter 9 Workbook Answers

8 **8** notebooks
Amount of money she has:
4 × 6 = 24
Number of notebooks:
24 ÷ 3 = 8

Exercise 9 pp. 51–54

1 (a) 42 (b) 666
(c) 330 (d) 648
(c) 163 (d) 151
(g) 55 (h) 683
(i) 580 (j) 271
(k) 68 (l) 206

2 (a) 21 (b) 6
(c) 8 (d) 8
(e) 5 (f) 3

3 (a) 8 × 5 = 40
40 corn seeds
(b) 32 ÷ 8 = 4
4 bean seeds
(c) 8 × 3 = 24
24 yellow squash seeds and 24 green squash seeds
(d) 24 + 24 = 48
48 squash seeds

4

(a)	6 × 5 = 30	$30
(b)	6 × 2 = 12	$12
(c)	30 + 12 = 42	$42
(d)	40 ÷ 10 = 4	4
(e)	40 ÷ 5 = 8	8
(f)	8 – 4 = 4	4
(g)	2 + 5 + 4 + 3 + 10 = 24 24 + 24 = 48 or: 4 + 10 + 8 + 6 + 20 = 48	$48

5

32	÷	4	=	8
–		+		+
20	÷	2	=	10
=		=		=
12	+	6	=	18

6 45 ÷ ✸ = **9**
Start with the last equation:
● = 8 ÷ 2 = 4
Then substitute 4 for the circles in the middle equation:
4 + ◆ + ◆ = 18
◆ + ◆ = 18 – 4 = 14
◆ = 14 ÷ 2 = 7
Substitute the values for the first equation.
7 + 4 + ✸ = 16
✸ = 16 – 11 = 5

7 6 different products
Make a systematic list:
2 × 3 = 6
2 × 4 = 8
2 × 5 = 10
3 × 4 = 12
3 × 5 = 15
4 × 5 = 20