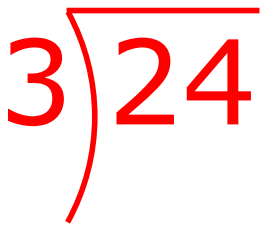

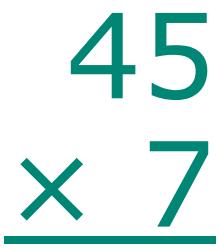

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Foundational Numeracy

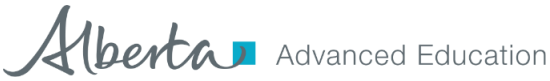
Module 3: Multiplying and Dividing Whole Numbers

Facilitator Guide

V 1.20 - July 2020

Developed for Alberta's Community Adult Learning Program

Funded by Alberta Advanced Education



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Contents

Introduction to the Module

In this module, you will work on basic math related to whole number arithmetic. Numeracy is important and is part of our complex world. Whether it is calculating a budget or paying bills, arithmetic skills are critical. Enjoy this module!

Important

When you see an object like the one below, you can either use the camera on your phone or tablet, or you can click on the link to play the video of the math example.

Want to watch a video of this lesson?

https://youtu.be/QtwiGWi5a7E

Note: The facilitator guide mirrors the Learner Guide with a couple of key differences.

- Facilitator notes throughout the module in boxes like this. Include teaching strategies and common errors
- Student practice doesn't have this bubble. Instructor led
  The instructor can teach the concept or the learner can watch the video.

Specific Learning Outcomes

The table below displays the skills and knowledge that you will explore in this module. This is your opportunity to evaluate your own skills to see if you can do these things. At the end of this module, you will be invited to re-evaluate your skills to measure the progress you have made.

In this module I will learn how to …	I can't do this	I can do this with help	I can do this!
1. Multiply whole numbers			
2. Divide whole numbers			
3. Solve problems using multiplication and division			

Essential Skills

The essential skills used in this module are the following:

Reading: Understanding materials written in sentences or paragraphs

Numeracy: Using and understanding numbers

Writing: Writing on paper or typing on a computer

Vocabulary: Gaining related vocabulary

Unit 1: Multiplication

Learning Objectives

- Identify the parts of a multiplication problem
- Know the multiplication table to nine
- Use the commutative property of multiplication
- Use the associative property of multiplication
- Multiply by single digit numbers
- Multiply larger numbers by a single-digit number
- Multiply larger numbers by a two-digit number

Keywords

Factors	Numbers you can multiply together to get another number. For example, **7 × 4** = 28
Multiplicand	The *first number* in a multiplication equation. For example, **7** × 4 = 28
Multiplier	The *second number* in a multiplication equation. For example, 7 × **4** = 28
Product	The *answer* or *result* of a multiplication equation. For example, 7 × 4 = **28**

Teaching Strategy

This is a great opportunity to have the learners work on their multiplication table to nine. This is as high as they need to learn or memorize as we can only multiply two digits together at one time. Provide the learners with a blank times table to nine. Have them fill in all the ones they know. Have them circle those with a colored pen. Then have them complete the rest by using multiples of the number. As they learn these, have them circle the new numbers they know, and don't need to use the chart for.

Flash cards work great for learning basic multiplication facts. You can use only one number and then work on all. An example of this is pull out all of the 3 × and × 3 to practice 3's.

Learner sees video on learning the multiplication table.

Lesson 1.1: Multiplication Table Basic Facts

Introductory Video: Learning Your Multiplications Table

SCAN ME

Want to watch a video of this lesson?

https://youtu.be/v1Ih3-mDPUk

Multiplication is the repeated addition of the same number.

For example, 8 + 8 + 8 + 8 means we are adding 8 four times. This can be expressed in terms of multiplication: 4 × 8 = 32.

In the above example, the repeated number (8) and the number of times it is used (4) are both called factors. The numbers 8 and 4, the two numbers multiplied, are factors of 32. The result of the multiplication is called the product.

4	×	8	=	32
↕		↕		↕
Factor	**×**	**Factor**	**=**	**Product**

Basic Multiplication Facts to Nine

Knowing your times table to nine makes doing math questions much quicker.

×	1	2	3	4	5	6	7	8	9
1	1	2	3	4	5	6	7	8	9
2	2	4	6	8	10	12	14	16	18
3	3	6	9	12	15	18	21	24	27
4	4	8	12	16	20	24	28	32	36
5	5	10	15	20	25	30	35	40	45
6	6	12	18	24	30	36	42	48	54
7	7	14	21	28	35	42	49	56	63
8	8	16	24	32	40	48	56	64	72
9	9	18	27	36	45	54	63	72	81

Practice Times Table

×	1	2	3	4	5	6	7	8	9
1									
2									
3									
4									
5									
6									
7									
8									
9									

Exercise 1.1

Multiplying One-Digit Numbers

Use your multiplication table to check your answers.

1. 5×3	2. 8×3	3. 2×5	4. 9×6	5. 7×9
6. 4×3	7. 6×7	8. 3×6	9. 1×1	10. 0×8
11. 9×7	12. 7×6	13. 4×3	14. 5×8	15. 8×2
16. 6×4	17. 8×5	18. 9×9	19. 2×9	20. 3×5
21. 8×2	22. 2×9	23. 7×7	24. 9×3	25. 4×6
26. 3×5	27. 6×8	28. 5×6	29. 7×5	30. 8×4
31. 4×8	32. 8×7	33. 6×9	34. 7×4	35. 9×5
36. 8×4	37. 7×9	38. 5×3	39. 3×6	40. 2×2
41. 7×4	42. 3×3	43. 2×7	44. 8×9	45. 6×8
46. 9×8	47. 8×6	48. 4×5	49. 2×7	50. 5×2

51. 7 × 6	52. 2 × 4	53. 5 × 6	54. 3 × 2	55. 7 × 3
56. 9 × 7	57. 6 × 6	58. 8 × 8	59. 4 × 9	60. 2 × 5
61. 5 × 4	62. 7 × 2	63. 6 × 5	64. 6 × 9	65. 4 × 4
66. 8 × 3	67. 1 × 8	68. 3 × 7	69. 9 × 3	70. 4 × 6
71. 8 × 6	72. 3 × 9	73. 9 × 4	74. 6 × 2	75. 5 × 5
76. 2 × 6	77. 5 × 3	78. 4 × 8	79. 7 × 8	80. 2 × 7
81. 5 × 4	82. 8 × 5	83. 2 × 8	84. 6 × 6	85. 2 × 3
86. 4 × 7	87. 7 × 6	88. 9 × 2	89. 3 × 4	90. 5 × 9
91. 7 × 5	92. 3 × 8	93. 3 × 4	94. 7 × 8	95. 2 × 6
96. 7 × 9	97. 8 × 3	98. 6 × 3	99. 5 × 7	100. 9 × 4

Lesson 1.2: Multiplication Properties

Teaching Strategy

It is important for learners to understand that just like adding, the order of numbers doesn't matter when multiplying. It is not as important to understand the terms as it is the process.

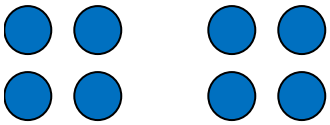
Commutative Property

The product of two factors is always the same. We can multiply two numbers in any order and get the same result.

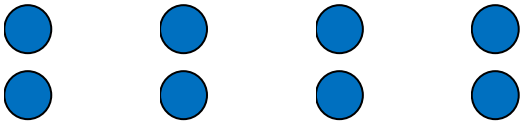
$m \times n = n \times m$

Example:

$2 \times 4 = 8$ means 2 groups of 4



$4 \times 2 = 8$ means 4 groups of 2



Student Example 1

Instructor led

$3 \times 4 =$

Want to watch a video of this lesson?
https://youtu.be/zwD1A9159F4

Associative Property

The product of three factors is always the same. Again we can multiply numbers in any order.

$(m \times n) \times r = m \times (n \times r)$

Example:

$3 \times 2 \times 4$	$3 \times 2 \times 4$
$3 \times (2 \times 4)$	$(3 \times 2) \times 4$
$3 \times (8)$	$(6) \times 4$
24	24

Student Example 2

Instructor led

$4 \times 5 \times 2 =$

SCAN ME

Want to watch a video of this lesson?
https://youtu.be/Wqxfm7EPcjo

Exercise 1.2

Multiplying Three Numbers

Note you can multiply the numbers in any order. You can look for two that you find easiest first and then multiply the product with the third number.

1. $2 \times 3 \times 1$
2. $2 \times 4 \times 3$
3. $3 \times 2 \times 4$
4. $2 \times 4 \times 5$
5. $3 \times 2 \times 5$
6. $4 \times 4 \times 5$
7. $3 \times 4 \times 5$
8. $3 \times 6 \times 5$
9. $9 \times 2 \times 2$
10. $2 \times 7 \times 3$
11. $6 \times 2 \times 5$
12. $7 \times 2 \times 5$
13. $2 \times 9 \times 5$
14. $8 \times 3 \times 5$
15. $6 \times 5 \times 5$
16. $2 \times 4 \times 7$
17. $9 \times 2 \times 4$
18. $3 \times 6 \times 4$
19. $6 \times 7 \times 5$
20. $8 \times 6 \times 5$

Lesson 1.3: Multiplying by 10, 100, and 1 000

Teaching Strategy

Understanding that multiplying by 10, 100, 1 000, the digits don't change but we are just really adding zeros to the number. This is an important skill to develop the understanding of estimating products.

There are shortcuts when multiplying by 10, 100, and 1 000.

- Add a zero when multiply by 10.
  3 × 10 = 30
- Add two zeros when multiply by 100.
  3 × 100 = 300
- Add three zeros when multiply by 1 000.
  3 × 1 000 = 3 000

Study the following examples closely:

Multiply		
By 10	**By 100**	**By 1 000**
3 × 10 = 30	3 × 100 = 300	3 × 1 000 = 3 000
84 × 10 = 840	84 × 100 = 8 400	84 × 1 000 = 84 000
172 × 10 = 1 720	172 × 100 = 17 200	172 × 1 000 = 172 000

Student Examples

Instructor led

1. 4 × 10 =

SCAN ME

Want to watch a video of this lesson?
https://youtu.be/SG4gX-VGzog

2. 2 × 100 =

3. 9 × 1 000 =

Exercise 1.3

1. $2 \times 10 =$
2. $5 \times 100 =$
3. $8 \times 1\,000 =$
4. $9 \times 100 =$
5. $6 \times 1\,000 =$
6. $1 \times 100 =$
7. $5 \times 1\,000 =$
8. $7 \times 10 =$
9. $8 \times 100 =$
10. $4 \times 100 =$
11. $6 \times 1\,000 =$
12. $2 \times 1\,000 =$
13. $6 \times 100 =$
14. $3 \times 1\,000 =$
15. $9 \times 10 =$

Lesson 1.4: Multiplying by a One-Digit Number

Teaching Strategy

Having learners practice estimating using front end rounding will help the learner when they are problem solving, as the learner will be able to decide quickly if they are doing the correct operation or not.

Learner will see Intro Video to multiplying as shown below.

Introductory Video:

SCAN ME

Want to watch a video of this lesson?

https://youtu.be/FJ5qLWP3Fqo

Rules for Estimating

1. Round each number to the place of the **last digit on the left**.
2. Multiply the rounded numbers.

Multiplier is the name given to the number doing the multiplying. In the example below, the multiplier is 3. Estimate first.

Example: Multiply 52 × 3

Estimate	*Actual*	
50	52	Multiply 3 × 2
× 3	× 3	Then multiply 3 × 5
150	**156**	

Student Example 1

Instructor led

Multiply: 3 × 60

SCAN ME

Want to watch a video of this lesson?

https://youtu.be/jb8mFpA1YI8

Examples 1 and 2

Student Example 2

Multiply: 50 × 7 =

Student Example 3

Instructor led

Multiply: 6 × 37 =

SCAN ME

Want to watch a video of this lesson?
https://youtu.be/SfxULALs_u8

Exercise 1.4

Solve the following. Use front-end rounding for the estimates.

	Estimate	Actual
1. 24 × 3	2 0 × 3	2 4 × 3
2. 46 × 2		
3. 17 × 4		
4. 18 × 9		
5. 14 × 5		

	Estimate	Actual
6. 32 × 6		
7. 45 × 7		
8. 33 × 8		
9. 67 × 3		
10. 78 × 6		
11. 59 × 4		
12. 72 × 5		
13. 53 × 8		

	Estimate	Actual
14. 29 × 3		
15. 38 × 6		
16. 341 × 7	3 0 0 × 7	3 4 1 × 7
17. 576 × 8		
18. 867 × 6		
19. 333 × 5		

	Estimate	Actual
20. 230 × 4		
21. 468 × 3		
22. 748 × 2		
23. 203 × 2		
24. 405 × 5		
25. 527 × 7		

	Estimate	Actual
26. 748 × 9		
27. 843 × 6		
28. 699 × 8		
29. 2 804 × 6		
30. 1 704 × 9		

Lesson 1.5: Multiplying by a Two-Digit Multiplier

Teaching Strategy

Teach learners that order doesn't matter when multiplying. It is easiest to put the number with the most digits on top and the number with the least digits on the bottom. Having student practice estimating allows learners to know what the answer should be close to and is beneficial when problem solving. Typical errors are the learner forgets to add the carried number or the learner doesn't move over one space when multiplying by the second digit and may make the same mistake when multiplying number by a 3rd digit.

Learner will see Intro Video as shown below.

Introductory Video:

SCAN ME

Want to watch a video of this lesson?

https://youtu.be/RVYwunbpMHA

Example:

Multiply: 29 × 34

Estimate	*Actual*	
30	2 3	
× 30	29	Multiply 4 × 9 = 36. Put the 6 under the 4 and carry the 3.
900	× 34	Multiply the 4 × 2 = 8 and add the 3 equals 11.
	116	Then put a 0 under the 6 as you are now multiplying by 30.
	+ 870	Multiply 3 × 9 = 27. Put the 7 under the 9 and carry the 2.
	986	Multiply 3 × 2 = 6 and add the 2 equal 8.
		Now add the two numbers: 116 + 870 = 986

Student Example 1

Instructor led

Estimate the product: 42 × 29

SCAN ME

Want to watch a video of this lesson?

https://youtu.be/tx2Niw7aJJ8

Student Example 2

Instructor led

Estimate the product: 8 291 × 27

SCAN ME

Want to watch a video of this lesson?

https://youtu.be/K0Nqpf7Dcrc

Student Example 3

Instructor led

Multiply: 36 × 27

SCAN ME

Want to watch a video of this lesson?
https://youtu.be/DaQlieZH1kk

Student Example 4

Instructor led

Multiply: 324 × 46

SCAN ME

Want to watch a video of this lesson?
https://youtu.be/RVYwunbpMHA
Watch from 2:15

Exercise 1.5

	Estimate	Actual
1. 38 × 23	4 0 × 2 0	3 8 × 2 3
2. 54 × 39		

	Estimate	Actual
3. 22 × 16		
4. 36 × 25		
5. 75 × 44		
6. 29 × 53		

	Estimate	Actual
7. 51 × 57		
8. 64 × 27		
9. 37 × 83		
10. 92 × 36		

	Estimate	Actual
11. 47 × 34		
12. 58 × 35		
13. 312 × 37	3 0 0 × 4 0	3 1 2 × 3 7
14. 57 × 225		

	Estimate	Actual
15. 12 × 205		
16. 374 × 83		
17. 543 × 78		
18. 692 × 65		

19. A car can travel 14 kilometres on 1 litre of gas. If the car's gas tank holds 45 litres, how far could this car travel on a full tank?

20. A can of pop holds 355 millilitres. How many millilitres of pop are there in a flat of 24 cans?

Unit 2: Division

Learning Objectives

- Identify parts of a division problem
- Write division in three different ways
- Divide with a single-digit divisor
- Divide with a two digit divisor

Keywords

Dividend	The *first number* in a division equation. For example, **30** ÷ 4 = 7 remainder 2
Divisor	The *second number* in a division equation. For example, 30 ÷ **4** = 7 remainder 2
Quotient	The *answer* or *result* of the division. For example, 30 ÷ 4 = **7** remainder 2
Remainder	The amount left over when the division of two numbers does not work out to an even whole number. For example, 30 ÷ 4 = 7 **r2**
Undefined	When a number is divided by 0, the result is called *undefined*. Undefined means the equation does not have meaning. For example, 30 ÷ 0 = **undefined**

Lesson 2.1: Division Facts

Teaching Strategy

Division is the opposite of multiplication. It is important that learners learn their multiplication table to nine in order to understand division. Flash cards work well for learners to practice division facts daily.

8 × 9 = 72 72 ÷ 9 = 8 72 ÷ 8 = 9

Division is the opposite of multiplication.

If you know your times table to nine then you can use that to learn your division facts.

Examples:

8 ÷ 4 we can think 4 × ? = 8 4 × **2** =8 so 8 ÷ 4 = **2**

72 ÷ 8 we can think 8 × ? = 72 8 × **9** =72 so 72 ÷ 8 = **9**

Exercise 2.1

Division Practice – No Remainders

Complete all of the questions you know by heart. Then go back and use you multiplication table to complete the rest.

1. $9\overline{)36}$	2. $6\overline{)48}$	3. $3\overline{)15}$	4. $7\overline{)35}$	5. $8\overline{)56}$
6. $4\overline{)28}$	7. $2\overline{)8}$	8. $5\overline{)20}$	9. $3\overline{)27}$	10. $6\overline{)36}$
11. $7\overline{)63}$	12. $8\overline{)16}$	13. $9\overline{)45}$	14. $2\overline{)18}$	15. $5\overline{)25}$
16. $9\overline{)27}$	17. $6\overline{)18}$	18. $9\overline{)81}$	19. $7\overline{)14}$	20. $6\overline{)42}$
21. $9\overline{)54}$	22. $4\overline{)32}$	23. $3\overline{)9}$	24. $8\overline{)40}$	25. $7\overline{)56}$
26. $7\overline{)21}$	27. $3\overline{)18}$	28. $4\overline{)16}$	29. $8\overline{)72}$	30. $4\overline{)20}$
31. $6\overline{)42}$	32. $5\overline{)15}$	33. $3\overline{)24}$	34. $5\overline{)35}$	35. $7\overline{)49}$
36. $2\overline{)12}$	37. $3\overline{)21}$	38. $8\overline{)64}$	39. $4\overline{)24}$	40. $7\overline{)42}$
41. $4\overline{)36}$	42. $8\overline{)48}$	43. $6\overline{)30}$	44. $3\overline{)12}$	45. $5\overline{)45}$
46. $9\overline{)18}$	47. $5\overline{)40}$	48. $8\overline{)24}$	49. $8\overline{)40}$	50. $7\overline{)28}$

Lesson 2.2: Division by One-Digit Divisors

Teaching Strategy

When teaching division with one digit numbers we need to remember that long division is really made up of multiplication and subtraction, and the process continues until there is a remainder and no numbers left to divide.

It is important to have the learners use the correct terminology as well. Dividend divided by the divisor = the quotient (answer).

If a learner knows their multiplication table have them complete the long division questions and continue to check to ensure they understand the process.

If a learner doesn't know their multiplication table have them list the multiples of the divisor as this will assist in their memory. Example 96 ÷ 4

Example 4 × 1 = 4, 4 × 2 = 8, 4 × 3 = 12, 4 × 4 = 16. Continue to 4 × 9 = 36. This will also assist learners in learning their multiplication facts.

Learner will see Intro Video as shown below.

Introductory Video:

SCAN ME

Want to watch a video of this lesson?

https://youtu.be/KGMf314LUc0

Division questions can be written in three ways:

$12 \div 4 = 3$ or $\frac{12}{4} = 3$ or $4\overline{)12}$

Quotient → 3

Dividend → 12

Divisor → 4

In the examples above, the number being divided is called the **dividend**, the number doing the dividing is called the **divisor**, and the result of the division is called the **quotient**.

Of the three examples that follow, the first shows the repeated subtraction method of dividing. Examples 2 and 3 illustrate the method we will use in this module.

Example 1

What is 14 ÷ 4?

Solution 1

14	10	6
− 4	− 4	− 4
10	6	2

We subtract 4 repeatedly until the number left (the remainder) is less than 4.

14 ÷ 4 = 3 remainder 2

Example 2

What is 14 divided by 4?

Solution 2

$$4\overline{)14}\quad 3,\ 12,\ 2$$

Step 1: 14 ÷ 4 = 3

Step 2: 3 × 4 = 12

Step 3: 14 − 12 = 2

- The 3 goes above the 4 as that is the last digit that is being divided.
- The 12 goes under the 14 and is subtracted from 14. The difference is 2.

14 ÷ 4 = 3 remainder 2

Example 3

Connor is supposed to buy slurpees for all the kids at daycare. He has $150, and slurpees cost $2 each. How many slurpees can he buy?

Solution 3

$$2\overline{)150}\quad 075,\ 14\downarrow,\ 10,\ 10,\ 0$$

Step 1: 15 ÷ 2 = 7

Step 2: 7 × 2 = 14

Step 3: 15 − 14 = 1

Step 4: Bring down the zero

Step 5: 10 ÷ 2 = 5

Step 6: 10 − 10 = 0

- The 0 in front of the 7 is not necessary, as 2 doesn't go into 1, it is there as a placeholder only.

150 ÷ 2 = 75

Rules for Whole Number Division

- Start with one digit – the one on the far left of the dividend.
- How many times does the divisor go into that digit? Write the answer up top.
- Multiply that answer by the divisor; put the result under the current digit in the dividend.
- Subtract.
- Bring down one more digit from the dividend, and start again. Continue in this manner until there are no more digits to bring down—the division is now finished.

Student Example 1

Instructor led

Divide: 96 ÷ 4

SCAN ME

Want to watch a video of this lesson?

https://youtu.be/KFzcwWTEDDI

Student Example 2

Instructor led

Divide: 23 ÷ 3

SCAN ME

Want to watch a video of this lesson?

https://youtu.be/8Ft5iHhauJ0

Watch video from 3:00

Student Example 3

Instructor led

Divide: 2 292 ÷ 4

SCAN ME

Want to watch a video of this lesson?

https://youtu.be/NcADzGz3bSI

Video for examples 3 and 4

Student Example 4

Divide: 6 475 ÷ 7

Exercise 2.2

Solve the following.

1. $15 \div 4$

2. $20 \div 7$

3. $24 \div 5$

4. $42 \div 8$

5. $64 \div 9$

6. $50 \div 6$

7. $51 \div 4$

8. $46 \div 5$

9. $93 \div 6$

10. $96 \div 5$

11. $41 \div 3$

12. $59 \div 4$

13. $21 \div 2$

14. $32 \div 3$

15. $164 \div 3$

16. $112 \div 5$

17. $152 \div 6$

18. $130 \div 7$

19. $281 \div 9$

20. $661 \div 8$

21. $525 \div 7$

22. $\frac{455}{5}$

23. $\frac{466}{8}$

24. $\frac{219}{9}$

25. $3\,019 \div 7$

26. $\frac{1\,725}{2}$

27. $2\,906 \div 5$

28. $3\,848 \div 8$

29. $2\,168 \div 4$

30. $\frac{5\,949}{6}$

31. Jenny can drive 624 kilometres in 8 hours. How far can she go in one hour?

Lesson 2.3: Division of Whole Numbers Involving Zeros

Teaching Strategy

Zeros in the quotient can be difficult for the learners. They need to understand that zeros become place holders as there must be a number above the dividend once they have started dividing.

Learner will see Intro Video as shown below.

Introductory Video:

SCAN ME

Want to watch a video of this lesson?

https://youtu.be/9g61DHPJ6zY

Once you start dividing every digit in the dividend must have a digit above in the quotient.

Example	Divide 812 by 2
Solution	$2\overline{)812}$ $-8\downarrow\downarrow$ 012 -12 0 Start: 8 divided by 2 is 4. 8 – 8 =0 Bring down the 1. 2 doesn't go into 1 so put a zero above the 1 in the quotient. Bring down the 2. Now 2 goes into 12, 6 times. 12 – 12=0 There is no remainder The quotient is 406.

Student Example 1

Instructor led

$4\overline{)832}$

SCAN ME

Want to watch a video of this lesson?

https://youtu.be/c1f3z8UEpjE

Video for examples 1 and 2

Student Example 2

$3\overline{)903}$

Student Example 3

Instructor led

Estimate the quotient: $7\overline{)286}$

Want to watch a video of this lesson?
https://youtu.be/YLQBYDvVhIo
Video for examples 3 and 4

Student Example 4

Estimate the quotient: $5\overline{)3\ 427}$

Exercise 2.3

Estimate the quotient then solve to find the actual answer.

	Estimate	Actual
1. 906 ÷ 3 =	$3\overline{)900}$	$3\overline{)906}$
2. 550 ÷ 5 =		

	Estimate	Actual
3. 613 ÷ 3 =		
4. 615 ÷ 2 =	$2\overline{)600}$	$2\overline{)615}$
5. 834 ÷ 4 =		
6. 761 ÷ 7 =		

	Estimate	Actual
7. 4 680 ÷ 9 =	$9\overline{)4\ 500}$	$9\overline{)4\ 680}$
8. 4 906 ÷ 7 =		
9. 4 832 ÷ 8 =		
10. 9 138 ÷ 7 =		

	Estimate	Actual
11. 8 427 ÷ 6 =		
12. 3 047 ÷ 5 =		
13. 8 008 ÷ 4 =		
14. 1 922 ÷ 3 =		

	Estimate	Actual
15. 3 524 ÷ 5 =		
16. 9 060 ÷ 3 =		
17. 7 270 ÷ 9 =		
18. 29 608 ÷ 4 =	$4\overline{)28\ 500}$	$4\overline{)29\ 608}$

	Estimate	Actual
19. 54 544 ÷ 6 =		
20. 28 215 ÷ 7 =		

Lesson 2.4: Estimation and Division with Two-Digit Divisors

Teaching Strategy

Have students estimate first. When students are learning division with two-digit divisors have the learners write the multiples of the number as it will speed up the work for them.

Example 18 as the divisor

Multiples 18, 36, 54, 72, 90, 108, 126, 144, 162

Represents ×1, ×2, ×3, ×4, ×5, ×6, ×7, ×8, ×9

Everything else in division works the same. Start with the left digits of the dividend and continue to work until there is no more numbers left to divide and there is only a remainder left.

The procedure when dividing with two-digit divisors is the same as that presented in the previous section. In general, the steps are as follows:

- **Step 1:** Divide to find the first digit of the quotient.
- **Step 2:** Multiply the first digit of the quotient by the divisor.
- **Step 3:** Subtract the product from the first two digits of the dividend.
- **Step 4:** Bring down the next digit in the dividend.

Next, repeat steps 1 to 4 until the remainder is less than the divisor.

Study the following example that illustrates the division process.

Example 1 Estimate the quotient when 683 is divided by 51.

Solution 1

$$5\cancel{0}\overline{)50\cancel{0}} = 5\overline{)50}$$

$$\begin{array}{r} 10 \\ \hline 50 \\ \underline{5} \\ 0 \end{array}$$

Round the divisor using front end rounding. Round the dividend to a compatible number (a number the rounded divisor will go into evenly)

Step 1: 51 rounds to 50. Round the dividend, 683, to 500.

Step 2: 500 ÷ 50 =
Cancel a zero from both numbers

Step 3: 50 ÷ 5 = 10

683 ÷ 51 is about 10.

Example 2	Find the quotient when 683 is divided by 51.
Solution 2	$51\overline{)683}$ → 13, 51, 173, 153, 20 How many times will 51 divide into 6? None, so use 68. **Step 1:** 68 ÷ 51 = 1 **Step 2:** 1 × 51 = 51 **Step 3:** 68 – 51 = 17 **Step 4:** Bring down the 3 Now repeat steps 1 to 4 beginning with 173 ÷ 51 The quotient is 13 r20.

Student Example 1

Instructor led

Estimate the quotient: $54\overline{)331}$

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https://youtu.be/ejD0ZXf17UQ
Video for examples 1 and 2

Student Example 2

Estimate the quotient: $81\overline{)7\,481}$

Student Example 3

Instructor led

Divide: 768 ÷ 32

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https://youtu.be/eIUoIhfupuA

Student Example 4

Instructor led

Divide: 7 182 ÷ 42

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https://youtu.be/xXIG8ouHcsc

Exercise 2.4

Estimate then find the actual answer.

	Estimate	Actual
1. $78 \div 13 =$	$10\overline{)80}$	$13\overline{)78}$
2. $\frac{85}{17}$	$20\overline{)80}$	$17\overline{)85}$
3. $264 \div 51$	$50\overline{)250}$	$51\overline{)264}$

	Estimate	Actual
4. 672 ÷ 24		
5. 187 ÷ 11		
6. 330 ÷ 14		
7. 806 ÷ 62		

	Estimate	Actual
8. 576 ÷ 23		
9. 768 ÷ 24		
10. 903 ÷ 21		
11. 293 ÷ 32		

	Estimate	Actual
12. 378 ÷ 63		
13. 694 ÷ 71		
14. 387 ÷ 54		
15. 654 ÷ 44		

	Estimate	Actual
16. 415 ÷ 62		
17. 786 ÷ 24		
18. 849 ÷ 82		
19. 3 186 ÷ 74	$70\overline{)2\,800}$	$74\overline{)3\,186}$

	Estimate	Actual
20. 2 406 ÷ 36		
21. 2 646 ÷ 33		
22. 4 758 ÷ 64		
23. 3 999 ÷ 72		

	Estimate	Actual
24. 4 411 ÷ 93		
25. 2 797 ÷ 58		
26. 3 606 ÷ 48		
27. 7 070 ÷ 15		

	Estimate	Actual
28. 6 527 ÷ 25		
29. 57 033 ÷ 49	$50\overline{)50\,000}$	$49\overline{)57\,033}$
30. 54 636 ÷ 12		

31. Jenna buys a used car from the local car dealer for $7 560. She wants to pay it off in 2 years by making 24 equal monthly payments. How much will she pay each month?

Lesson 2.5: Multiplication and Division Word Problems

Learning Objectives

- Use keywords and multiplication/division strategies to solve application problems

Teaching Strategy

Make sure the learner reads the question several times and understands what the question is asking, which is always followed by a question mark. There are sometimes numbers in the question that are not needed and are there to throw the learner off. Get learners to estimate as this will tell them quickly if the operation is correct as the answer will be reasonable or unreasonable. When writing the final answer in sentence form, have them rewrite the question as a statement.

Key Words

Multiplication	Division	Equals
product	divided by	is
double	divided into	the same as
triple	quotient	equals
times	goes into	equals to
of	divide	yields
twice	divided equally	results in
twice as much	per	are

Keep in mind that questions will sometimes *not* use the words above, but will *imply* that you need to find a total.

Think about...

When facing word problems, not only notice keywords in the question, but also look at what is happening in the "story" part of the problem. Do you already have a total number of something?

Be careful of extra information that is not needed to answer the question, and always be prepared for problems that involve more than one step.

Steps for Problem Solving

1. Read the problem carefully to ensure that you understand what is being asked.
2. Decide what to do to solve the problem.
3. Write a number sentence to show how you would arrive at the answer, then do the calculations.
4. Estimate by front end rounding, as this will assist you to determine if the answer will be reasonable or not. If the answer is reasonable move to number 5, if not estimate using a different operation.
5. Solve the equation.
6. Write the final answer in a clear, concise sentence using the appropriate units.

Study the following examples:

Example 1:

A certain river in Argentina is four times longer than a river in Brazil. The river in Brazil is 765 km long. How long is the river in Argentina?

Solution:

Number sentence	Estimate	Calculation	Answer in sentence form
765 × 4	800 × 4 3 200	765 × 4 3 060	The river in Argentina is about 3 060 km long.

Example 2:

Sandra earns $47 000 each year. How much, in total, will she earn in 5 years?

Solution:

Number sentence	Estimate	Calculation	Answer in sentence form
47 000 × 5	50 000 × 5 250 000	47 000 × 5 235 000	Sandra will earn $235 000 in five years.

Example 3:

Alpana buys a new television set for $1 200. She will pay for it in 10 equal payments. How much will each payment be?

Solution:

Number sentence	Estimate	Calculation	Answer in sentence form
1 200 ÷ 10	$10\overline{)1\,000}$ 100	$10\overline{)1\,200}$ 120	Each payment will be $120.

Example 4:

A bakery shop made 270 cookies. It sells the cookies in packages. Each package has 6 cookies. How many packages of cookies does the bakery have for sale?

Solution:

In this estimate you want to find a number that 6 goes into evenly.

Number sentence	Estimate	Calculation	Answer in sentence form
270 ÷ 6	$6\overline{)300}$ 50	$6\overline{)270}$ 45	The bakery has 45 packages of cookies for sale.

Student Example 1

Instructor led

Toby plants 12 rows of carrots in a field. He plants 6 carrots in each row. How many carrots did he plant?

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https://youtu.be/fZtUn_THXnk

Student Example 2

Instructor led

Blair scored 144 point in field goals this season. He scored all of his points kicking 50 yard field goals each worth 3 points. He played in 16 games this season. How many field goals did Blair make per game assuming that he made the same amount of field goals each game?

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https://youtu.be/anlOhNHlqwg

Exercise 2.5

Solve the following word problems. Remember to write a statement.

1. Chris made $53 at his part time job every day for 3 weeks (21 days). How much money did he make in the three weeks?

2. Eight co-workers shared a lottery ticket that just won $30 192. If they split the money evenly, how much does each person get?

3. Andrew earns $32 per hour. How much will he earn if he works 76 hours over the next two weeks?

4. Xu worked 36 hours and received $648 pay. What is her hourly wage?

5. A can of pop contains 355 millilitres of pop. How many millilitres will be in 48 cans?

6. If a box contains 48 envelopes, how many envelopes would there be in 26 boxes?

7. A salesman traveled 2 075 kilometres in 5 days. If he drove the same distance each day, then how many kilometres did he travel each day?

8. At a town hall meeting, there are 6 people who want to speak. The meeting is 88 minutes long. If you give all 6 people equal time, how much time will each speaker get? Will there be any time left over?

9. A passenger aircraft is flying at a speed of 670 km/hr (kilometres per hour). At this rate of speed, how many kilometers will the plane travel in 12 hours?

10. Jeremy walked 837 km in 27 days. Assuming he walked the same distance each day, then how many km did he walk each day?

Lesson 2.6: More Complex Problems

Addition	Subtraction	Multiplication	Division	Equals
plus	less	product	divided by	is
more	subtract	double	divided into	the same as
more than	subtracted from	triple	quotient	equals
added to	difference	times	goes into	equals to
increased by	less than	of	divide	yields
sum	fewer	twice	divided equally	results in
total	decreased by	twice as much	per	are
sum of	loss of			
increase of	minus			
gain of	take away			

Student Example

Instructor led

Abe went running 4 days this week. He ran 9 kilometres each day. Beth ran 15 fewer kilometres than Abe that week. How many kilometres did Beth run?

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https://youtu.be/HL1wuw_k984

Exercise 2.6

1. Isabell has volunteered to bake desserts for her school bake sale. She baked 1 dozen (12) brownies and will sell them for $4 each. She also baked two dozen cupcakes and plans to sell them for $5 each. How much money will Mary raise if she sells all of her baked goods?

2. A group of six foreign language students plans a summer trip to Germany. The total cost of all six flights is $8 400. Each person will also pay $600 for the hotel. If all six students pay the same amount for the flight, what is the cost of the entire trip for each student, including the cost of the hotel?

3. A theatre in Edmonton holds 1 000 people. If the main floor has 24 rows of 30 seats each and the balcony has 14 rows. How many seats must be in each row in the balcony?

4. Brian and Tracy are saving money to split evenly between their three kids. If Brian saves $420 and Tracy saves $342, how much money will each child receive?

5. Glen and his wife and two other couples go for dinner which cost $175, they went to the movie which cost $14 per person and paid $26 dollars to park. If the couples split the cost evenly, how much does each couple have to pay?

6. In the month of June, the Anderson family made four deposits of $1 782 each to their bank account. They also withdrew $5 931 for expenses. What was the account balance for the month of June, assuming they had nothing in the account at the start of the month?

Glossary for this Module

Dividend	The *first number* in a division equation. For example, **30** ÷ 4 = 7 remainder 2
Divisor	The *second number* in a division equation. For example, 30 ÷ **4** = 7 remainder 2
Factors	Numbers you can multiply together to get another number. For example, **7 × 4** = 28
Multiplicand	The *first number* in a multiplication equation. For example, **7** × 4 = 28
Multiplier	The *second number* in a multiplication equation. For example, 7 × **4** = 28
Product	The *answer* or *result* of a multiplication equation. For example, 7 × 4 = **28**
Quotient	The *answer* or *result* of the division. For example, 30 ÷ 4 = **7** remainder 2
Remainder	The amount left over when the division of two numbers does not work out to an even whole number. For example, 30 ÷ 4 = 7 **r2**
Undefined	When a number is divided by 0, the result is called *undefined*. Undefined means the equation does not have meaning. For example, 30 ÷ 0 = **undefined**

Answer Key

Unit 1

Exercise 1.1

1. 15	2. 24	3. 10	4. 54	5. 63
6. 12	7. 42	8. 18	9. 1	10. 0
11. 63	12. 42	13. 12	14. 40	15. 161
16. 24	17. 40	18. 81	19. 18	20. 15
21. 16	22. 18	23. 49	24. 27	25. 24
26. 15	27. 48	28. 30	29. 35	30. 32
31. 32	32. 56	33. 54	34. 28	35. 45
36. 32	37. 63	38. 15	39. 18	40. 4
41. 28	42. 9	43. 14	44. 72	45. 48
46. 72	47. 56	48. 20	49. 14	50. 10
51. 42	52. 8	53. 30	54. 6	55. 21
56. 63	57. 36	58. 64	59. 36	60. 10
61. 20	62. 14	63. 30	64. 54	65. 16
66. 24	67. 8	68. 21	69. 27	70. 24
71. 48	72. 27	73. 36	74. 12	75. 25
76. 12	77. 15	78. 32	79. 56	80. 14
81. 20	82. 40	83. 16	84. 36	85. 6
86. 28	87. 42	88. 18	89. 12	90. 45
91. 35	92. 24	93. 12	94. 56	95. 12
96. 63	97. 24	98. 18	99. 35	100. 36

Exercise 1.2

1. 6	2. 24	3. 24	4. 40	5. 30
6. 80	7. 60	8. 90	9. 36	10. 42
11. 60	12. 70	13. 90	14. 120	15. 150
16. 56	17. 72	18. 72	19. 210	20. 240

Exercise 1.3

1. 20	2. 500	3. 8 000	4. 900	5. 6 000
6. 100	7. 5 000	8. 70	9. 800	10. 400
11. 6 000	12. 2 000	13. 600	14. 3 000	15. 90

Exercise 1.4

	Estimate	Actual
1.	60	72
3.	80	68
5.	50	70
7.	350	315
9.	210	201
11.	240	236
13.	400	424
15.	240	228
17.	4 800	4 608
19.	1 500	1 665
21.	1 500	1 404
23.	400	406
25.	3 500	3 689
27.	4 800	5058
29.	18 000	16 824

	Estimate	Actual
2.	100	92
4.	180	162
6.	180	192
8.	240	264
10.	480	468
12.	350	360
14.	90	87
16.	2 100	2 387
18.	5 400	5 202
20.	800	920
22.	1 400	1 496
24.	2 000	2 025
26.	6 300	6 732
28.	5 600	5 592
30.	18 000	15 336

Exercise 1.5

	Estimate	Actual
1.	800	874
3.	400	352
5.	3 200	3300
7.	3 000	2 907
9.	3 200	3 071
11.	1 500	1 598
13.	12 000	11 544
15.	2 000	2 460
17.	40 000	42 354

	Estimate	Actual
2.	2 000	2 106
4.	1 200	900
6.	1 500	1 537
8.	1 800	1 728
10.	3 600	3 312
12.	2 400	2 030
14.	12 000	12 825
16.	32 000	31 042
18.	49 000	44 980

19. The car can travel 630 kilometres on a full tank of gas.

20. There are 8 520 millilitres in 24 cans of pop.

Unit 2

Exercise 2.1

1. 4	2. 8	3. 5	4. 5	5. 7
6. 7	7. 4	8. 4	9. 9	10. 6
11. 9	12. 2	13. 5	14. 9	15. 5
16. 3	17. 3	18. 9	19. 2	20. 7
21. 6	22. 8	23. 3	24. 5	25. 8
26. 3	27. 6	28. 4	29. 9	30. 5
31. 7	32. 3	33. 8	34. 7	35. 7
36. 6	37. 7	38. 8	39. 6	40. 6
41. 9	42. 6	43. 5	44. 4	45. 9
46. 2	47. 8	48. 3	49. 5	50. 4

Exercise 2.2

1.	3 r3	2.	2 r6	3.	4 r4	4.	5 r2	5.	7 r1
6.	8 r2	7.	12 r3	8.	9 r1	9.	15 r3	10.	19 r1
11.	13 r2	12.	14 r3	13.	10 r1	14.	10 r2	15.	54 r2
16.	22 r2	17.	25 r2	18.	18 r4	19.	31 r7	20.	82 r5
21.	75	22.	91	23.	58 r2	24.	24 r3	25.	431 r2
26.	862 r1	27.	581 r1	28.	481	29.	542	30.	991 r3

31. Jenny can drive 78 kilometres in one hour.

Exercise 2.3

	Estimate	Actual
1.	300	302
3.	200	204 r1
5.	200	208 r2
7.	500	520
9.	600	604
11.	1 000	1 404 r3
13.	2 000	2 002
15.	700	704 r4
17.	800	807 r7
19.	9 000	9 090 r4

	Estimate	Actual
2.	100	110
4.	300	307 r1
6.	100	108 r5
8.	700	700 r6
10.	1000	1 305 r3
12.	600	609 r2
14.	600	640 r2
16.	3 000	3 020
18.	7 000	7 652
20.	4 000	4 030 r5

Exercise 2.4

	Estimate	Actual
1.	8	6
3.	5	5 r9
5.	20	17
7.	10	13
9.	40	32
11.	10	9 r5
13.	10	9 r55
15.	20	14 r38
17.	40	32 r18
19.	40	43 r4
21.	90	80 r6
23.	60	55 r39
25.	50	48 r13
27.	400	471 r5
29.	1 000	1163 r46

	Estimate	Actual
2.	4	5
4.	30	28
6.	30	23 r8
8.	30	25 r1
10.	50	43
12.	6	6
14.	7	7 r9
16.	7	6 43
18.	10	10 r29
20.	60	66 r30
22.	80	74 r22
24.	50	47 r40
26.	70	75 r6
28.	200	261 r2
30.	5 000	4553

31. Jenna will pay $315 each month for 24 months.

Exercise 2.5

1. Chris made $1 113 in 3 weeks.
2. Each co-worker will get $3 774.
3. Andrew will earn $2 432.
4. Xu’s hourly wage is $18.
5. There are 17 040 mL in 48 cans.
6. There would be 1 248 envelopes.
7. The sales man traveled 415 kilometres each day.
8. Each person will get 14 minutes to speak. There will be 4 minutes left over.
9. The plane will travel 9 380 km.
10. Jeremy walked 31 kilometres each day.

Exercise 2.6

1. Mary will raise $168.
2. The students will pay $2 000 each.
3. The balcony will have 20 seats in each row.
4. Each child will get $274.
5. Each couple will pay $95.
6. The account balance for June was $ 1 197.