

SM

Dimensions M
Textbook 5

Workbook 5A

680,521,823

 8.427×50

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$$\frac{2}{5} - (\frac{2}{5} - \frac{1}{3})$$

GLUE

Singapore Math Inc.

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Chapter 1 Whole Numbers

Exercise 1

Basics

- 1 (a) Write the number that is 1 more than 999,999 in numerals and in words.
1,000,000
One million
- (b) Write the number that is 1 more than 9,999,999 in numerals and in words.
10,000,000
Ten million
- (c) Write the number that is 1 more than 99,999,999 in numerals and in words.
100,000,000
One hundred million

Millions			Thousands			Ones		
Hundred Thousands	Ten Thousands	One Thousand	Hundred Thousands	Ten Thousands	One Thousand	Hundreds	Tens	Ones
7	4	2	9	1	6	3	8	5

- (a) Write the number in numerals and in words.
742,916,385
Seven hundred forty-two million, nine hundred sixteen thousand, three hundred eighty-five
- (b) The value of the digit 2 is $2 \times$ 1,000,000 = 2,000,000
- (c) The value of the digit 4 is $4 \times$ 10,000,000 = 40,000,000
- (d) The value of the digit 7 is $7 \times$ 100,000,000 = 700,000,000

1-1 Numbers to One Billion

1

Practice

- 3 609,304,049
 - (a) Write the number in words.
Six hundred nine million, three hundred four thousand, forty-nine
 - (b) The value of the digit in the one millions place is 9,000,000.
 - (c) The value of the digit in the one thousands place is 4,000.
 - (d) Write the names of all the places with the digit 0.
ten millions place, ten thousands place, hundreds place
 - (e) One hundred million more than 609,304,049 is 709,304,049.
 - (f) Ten million less than 609,304,049 is 599,304,049.

- 4 Write the numbers in numerals.

Two million, four hundred forty-seven thousand, sixteen	2,447,016
Seventy-four million, three hundred seven	74,000,307
Eighty-two million, eighty-two	82,000,082
Four hundred six million, fifty-seven thousand, three	406,057,003

2

1-1 Numbers to One Billion

- 5 (a) $60,000,000 + 2,000,000 + 50,000 + 200 + 30 + 9 =$ 62,050,239
- (b) $400,000,000 + 600,000 + 5,000 + 30 =$ 400,605,030
- (c) $203,800,062 = 200,000,000 +$ 3,800,000 $+ 62$
- (d) $5,500,555 = 500 +$ 5,000,000 $+ 55 + 500,000$

- 6 Write the numbers in order from greatest to least.

680,125,823	680,125,283	680,521,823	608,125,823
680,521,823	680,125,823	680,125,283	608,125,823

- 7 Write $>$, $<$, or $=$ in each \bigcirc .

- (a) $80,000,000 + 60,000 \bigcirc 50,000 + 400,000,000 + 900,000$
- (b) Six hundred twenty millions \bigcirc 60 hundred thousands
- (c) Eight hundred millions \bigcirc 800,000 thousands
- (d) $60,832,000 - 10,000 \bigcirc 59,823,000 + 10,000,000$

1-1 Numbers to One Billion

3

Challenge

- 8 (a) 4 millions = 40 hundred thousands
- (b) 4 millions = 400 ten thousands
- (c) 4 millions = 4,000 thousands
- (d) 4 millions = 40,000 hundreds
- (e) 4 ten millions = 4,000 ten thousands
- (f) 4 hundred millions = 4,000 hundred thousands
- (g) 4 hundred millions = 400,000 thousands

- 9 Write the numbers in numerals.

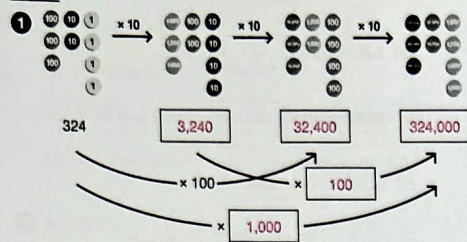
430 thousand thousands	430,000,000
9,860 ten thousands	98,600,000
60 thousand thousands, 40 hundred hundreds	60,400,000
8 ten thousands, 56 hundred thousands, 8 ones	5,680,008
8,000 ones + 12,000 tens + 4 millions	4,128,000
4,000 tens + 3,000 thousands + 6,000 ones + 50,000 ten thousands	503,046,000

4

1-1 Numbers to One Billion

Exercise 2

Basics



- 2 (a) $324 \times 1 = 324$
 (b) $324 \times 10 = 3,240$
 (c) $3,240 \times 10 = 32,400$
 (d) $32,400 \times 10 = 324,000$
 (e) $324 \times 100 = 32,400$
 (f) $3,240 \times 100 = 324,000$
 (g) $324 \times 1,000 = 324,000$
- 3 (a) $6,201 \times 10 \times 10 \times 10 = 6,201 \times 1,000 = 6,201,000$
 (b) $80,620 \times 10 \times 10 = 80,620 \times 100 = 8,062,000$

1-2 Multiplying by 10, 100, and 1,000

5

Practice

- 4 (a) $245 \times 100 = 24,500$
 (b) $1,080 \times 10 = 10,800$
 (c) $100 \times 6,230 = 623,000$
 (d) $3,240 \times 100 = 324,000$
 (e) $400,000 \times 10 = 4,000,000$
 (f) $700 \times 1,000 = 700,000$
 (g) $420 \times 1,000 = 420,000$
 (h) $1,000 \times 6,004 = 6,004,000$
- 5 (a) $85 \times 1,000 = 85,000$
 (b) $430 \times 100 = 43,000$
 (c) $1,000 \times 40 = 40,000$

1-2 Multiplying by 10, 100, and 1,000

6

- (d) $10 \times 7,200 = 72,000$
 (e) $1,000 \times 100 = 100,000$
 (f) $600 \times 100 = 60,000$

Challenge

- 6 There are 1,000 paper clips in a box. The boxes are packed in crates with 100 boxes of paper clips in each crate. How many paper clips are in 100 crates?
 In 1 crate: $1,000 \times 100 = 100,000$
 In 100 crates: $100,000 \times 100 = 10,000,000$
 10,000,000 paper clips



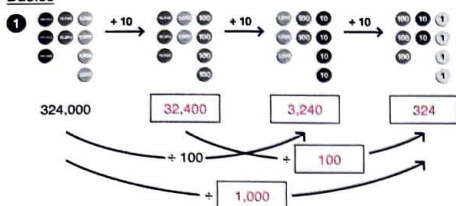
- 7 (a) $10 \times 10 \times 10 \times 10 \times 10 = 100,000$
 (b) $100 \times 10 \times 10 = 100,000$
 (c) $40 \times 10 \times 100 = 40,000$
 (d) $100 \times 10,000 \times 80 = 80,000,000$

1-2 Multiplying by 10, 100, and 1,000

7

Exercise 3

Basics



- 2 (a) $3,240 \div 10 = 324$
 (b) $32,400 \div 10 = 3,240$
 (c) $324,000 \div 10 = 32,400$
 (d) $32,400 \div 100 = 324$
 (e) $324,000 \div 100 = 3,240$
 (f) $324,000 \div 1,000 = 324$

- 3 (a) $56,000 \div 100 = \frac{56,000}{100} = 560$
 (b) $5,600,000 \div 1,000 = \frac{5,600,000}{1,000} = 5,600$

Practice

- 4 (a) $1,300 \div 10 = 130$
 (b) $8,200 \div 100 = 82$
 (c) $98,000 \div 100 = 980$
 (d) $62,000 \div 10 = 6,200$
 (e) $400,000 \div 10 = 40,000$
 (f) $720,000 \div 100 = 7,200$
 (g) $920,000 \div 1,000 = 920$
 (h) $3,090,000 \div 100 = 30,900$
- 5 (a) $8,500,000 \div 100 = 85,000$
 (b) $620,000 \div 10 = 62,000$
 (c) $4,500,000 \div 1,000 = 4,500$

- 6 A supplier paid \$71,000 for 1,000 portable photo printers. How much did the supplier pay for each portable photo printer?

$71,000 \div 1,000 = 71$
 \$71

Challenge

- 7 For a Box Tops for Education program, purchasing 1,000 participating products with Box Tops logos and scanning the receipts is worth \$100. If 630 students each uploaded 100 Box Top scans, how much money will the school receive?

$630 \times 100 = 63,000$
 Number of thousands: $63,000 \div 1,000 = 63$
 $63 \times \$100 = \$6,300$
 \$6,300



- 8 (a) $100,000,000 \div 10 \div 10 \div 10 \div 10 = 10,000$
 (b) $20,000,000 \div 10 \div 100 = 20,000$
 (c) $3,400,000 \div 1,000 \div 100 = 34$
 (d) $700,000,000 \div 10,000 \div 100 = 700$

Exercise 4

Basics

- 1 (a) 31×5 ones = $\boxed{155}$ ones = $\boxed{155}$
 (b) 31×5 tens = $\boxed{155}$ tens = $\boxed{1,550}$
 (c) 31×5 hundreds = $\boxed{155}$ hundreds = $\boxed{15,500}$
 (d) 31×5 thousands = $\boxed{155}$ thousands = $\boxed{155,000}$

- 2 (a) $28 \times 4 = \boxed{112}$
 (b) $28 \times 40 = 28 \times 4 \times 10$
 $= \boxed{112} \times 10$
 $= \boxed{1,120}$
 (c) $28 \times 400 = 28 \times 4 \times 100$
 $= \boxed{112} \times 100$
 $= \boxed{11,200}$
 (d) $28 \times 4,000 = 28 \times 4 \times 1,000$
 $= \boxed{112} \times 1,000$
 $= \boxed{112,000}$

1-4 Multiplying by Tens, Hundreds, and Thousands

11

- 3 (a) $5 \times 8 = \boxed{40}$
 (b) $5,000 \times 8 = 8 \times 5,000$
 $= \boxed{40,000}$
 (c) $5,000 \times 8,000 = 5,000 \times 8 \times 1,000$
 $= \boxed{40,000} \times 1,000$
 $= \boxed{40,000,000}$

Practice

- 4 (a) $35 \times 20 = \boxed{700}$
 (b) $350 \times 2 = \boxed{700}$
 (c) $35 \times 200 = \boxed{7,000}$
 (d) $350 \times 20 = \boxed{7,000}$
 (e) $35 \times 2,000 = \boxed{70,000}$
 (f) $3,500 \times 20 = \boxed{70,000}$
 (g) $3,500 \times 200 = \boxed{700,000}$
 (h) $3,500 \times 2,000 = \boxed{7,000,000}$

1-4 Multiplying by Tens, Hundreds, and Thousands

12

- 5 (a) $7 \times 400 = \boxed{2,800}$
 (b) $5 \times 8,000 = \boxed{40,000}$
 (c) $41 \times 6,000 = \boxed{246,000}$
 (d) $25 \times 40,000 = \boxed{1,000,000}$
 (e) $800 \times 9,000 = \boxed{7,200,000}$
 (f) $7,000 \times 800 = \boxed{5,600,000}$
 (g) $32,000 \times 400 = \boxed{12,800,000}$
 (h) $2,100 \times 500 = \boxed{1,050,000}$
 (i) $25,000 \times 600 = \boxed{15,000,000}$
 (j) $10,600 \times 900 = \boxed{9,540,000}$

- 6 New Zealand has a population of about 4 million people. There are about 20 times as many sheep in New Zealand as people. About how many sheep are in New Zealand?
 $4,000,000 \times 20 = 80,000,000$
 About 80,000,000 sheep



1-4 Multiplying by Tens, Hundreds, and Thousands

13

Exercise 5

Basics

1 (a) $850 \div 5 = 85 \text{ tens} \div 5$

$= 17 \text{ tens}$

$= 170$

(b) $8,500 \div 5 = 85 \text{ hundreds} \div 5$

$= 17 \text{ hundreds}$

$= 1,700$

(c) $85,000 \div 5 = 85 \text{ thousands} \div 5$

$= 17 \text{ thousands}$

$= 17,000$

2 (a) $40,000 \div 8,000 = 40,000 \div 1,000 \div 8$

$= 40 \div 8$

$= 5$

(b) $40,000 \div 800 = 40,000 \div 100 \div 8$

$= 400 \div 8$

$= 50$

(c) $40,000 \div 80 = 40,000 \div 10 \div 8$

$= 4,000 \div 8$

$= 500$

3 (a) $56,000 \div 700 = \frac{56,000}{700} = \frac{560}{7} = 80$

(b) $5,600,000 \div 7,000 = \frac{5,600,000}{7,000} = \frac{5,600}{7} = 800$

(c) $80,000 \div 500 = \frac{80,000}{500} = \frac{800}{5} = 160$

(d) $960,000 \div 80 = \frac{960,000}{80} = \frac{96,000}{8} = 12,000$

Practice

4 (a) $96 \div 6 = 16$

(b) $9,600 \div 600 = 16$

(c) $960,000 \div 600 = 1,600$

(d) $960,000 \div 6,000 = 160$

(e) $9,600,000 \div 6,000 = 1,600$

5 (a) $630,000 \div 9,000 = 70$

(b) $32,000 \div 400 = 80$

(c) $4,800,000 \div 6,000 = 800$

(d) $810,000,000 \div 9,000 = 90,000$

(e) $360,000,000 \div 600 = 600,000$

(f) $300,000 \div 600 = 500$

(g) $100,000 \div 4,000 = 25$

(h) $120,000 \div 5,000 = 24$

6 A grocer paid \$4,500 for 300 bushels of apples. How much did 1 bushel of apples cost?

$4,500 \div 300 = 15$
\$15



Exercise 6

Check

- 1 (a) The digit 7 is in the ten millions place in the number 378,903,400.
 - (b) The digit 0 is in the ten thousands place in the number 24,302,627.
 - (c) The value of the digit 2 in 542,390,108 is 2,000,000.
 - (d) 3,000,000 has 3,000 thousands.
 - (e) 53,900,000 has 5,390 ten thousands.
 - (f) The value of the digit 6 in 460 ten thousands is 600,000.
 - (g) 100 more than one million is the number 1,000,100.
 - (h) 1 less than one million is the number 999,999.
 - (i) 1 billion is 1,000 times more than 1 million.
 - (j) 6,500,000 is 100 times as great as 65,000.
- 2 Write >, < or = in each \bigcirc .
 - (a) 5,983,426 \bigcirc 5,983,416
 - (b) Seventy million, six hundred forty-seven thousand \bigcirc 240,674,000
 - (c) $80,000 + 40,000,000 + 900$ \bigcirc $40,800,000 + 9,000$

- 3 (a) $904,190 \times 100 =$ 90,419,000
- (b) $9,000 \times 400 =$ 3,600,000
- (c) $1,600 \times 5,000 =$ 8,000,000
- (d) $1,200,000 \div 100 =$ 12,000
- (e) $154,000 \div 700 =$ 220
- (f) $6,020,000 \div 20,000 =$ 301

- 4 Using each digit from 0 to 8 only once, write the least 9-digit odd number with 7 in the ten thousands place.
102,374,685

Challenge

- 5 Write >, <, or = in each \bigcirc .
 - (a) $50 \times 80 \times 100 \times 10$ \bigcirc $10 \times 100 \times 1,000 \times 4$
 - (b) $960,000 \times 8$ \bigcirc $960,000,000 \div 800$
- 6 (a) In 57,598,851, if the digit 7 is replaced by the digit 5, the new number is 2,000,000 less than the old number.
 - (b) In 460,381,974, the value of the digit in the hundred millions place is 5,000 times the value of the digit in the ten thousands place.

Chapter 2 Writing and Evaluating Expressions

Exercise 1

Basics

In general, calculate from left to right.
Find the value in parentheses first.

- 1 75 craft sticks are required to make a large box, and 25 craft sticks are required to make a small box. Aisha is making sets that include one large and one small box. How many sets could she make with 500 craft sticks?

$$\begin{aligned} \text{Total craft sticks} & \div \text{Number of craft sticks per set} \\ = 500 & \div (75 + 25) \\ = 500 & \div 100 \\ = 5 \end{aligned}$$

- 2 (a) $800 - 120 + 250$
 $= 680 + 250$
 $= 930$
- (b) $800 - (120 + 250)$
 $= 800 - 370$
 $= 430$
- (c) $320 \div 4 \times 5$
 $= 80 \times 5$
 $= 400$
- (d) $320 \div (4 \times 5)$
 $= 320 \div 20$
 $= 16$

Practice

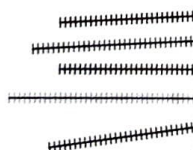
- 3 Find the values.

- (a) $400 - 53 - 27$
320
- (b) $400 - (53 - 27)$
374
- (c) $81 \div 9 + 3$
3
- (d) $81 \div (9 + 3)$
27
- (e) $180 \div (2 \times 3)$
30
- (f) $4 \times (60 - 22)$
152
- (g) $10,000 \div (48 \div 6)$
1,250
- (h) $640,000 \div (7,000 - 3,000)$
160

- 4 Jamal had a package of 200 pipe cleaners. He made 3 woven baskets. Each basket used 35 pipe cleaners. Write an expression to find the number of pipe cleaners he has left, and then find the value.

$$200 - (3 \times 35) = 95$$

95 pipe cleaners



Challenge

- 5 In each of the following, use each of the numbers 9, 3, and 3 once to make the equations true. *Solutions may vary.*

(a) $9 \times 3 + 3 = 9$

(b) $9 \div 3 - 3 = 0$

(c) $9 \times (3 - 3) = 0$

(d) $3 \times (9 + 3) = 9$

(e) $9 - 3 - 3 = 3$

(f) $9 \div (3 \times 3) = 1$

(g) $9 + (3 - 3) = 9$

(h) $3 - 3 + 9 = 9$

Exercise 2

Basics

In general, calculate from left to right.
Do multiplication and/or division first.
Then do addition and/or subtraction.

- 1 Jeff is making 2 boxes and 3 picture frames using craft sticks. Each box requires 125 sticks and each picture frame requires 75 sticks. How many craft sticks does he need?

Number of sticks for box	+	Number of sticks for frame
= 2×125	+	3×75
= 250	+	225
= 475		

- 2 (a) $15 + 500 \div 2$

$$= 15 + \text{250}$$

$$= \text{265}$$

- (c) $54 - 8 \times 5 + 10$

$$= 54 - \text{40} + 10$$

$$= \text{14} + 10$$

$$= \text{24}$$

- (b) $4 \times 2 - 10 \div 5$

$$= \text{8} - \text{2}$$

$$= \text{6}$$

- (d) $75 - 420 \div 7 + 3 \times 15$

$$= 75 - \text{60} + \text{45}$$

$$= \text{15} + \text{45}$$

$$= \text{60}$$

Practice

- 3 Find the values.

(a) $64 - 3 \times 9$
37

(b) $200 - 125 \div 25$
195

(c) $200 + 25 \times 4$
300

(d) $75 \div 5 - 4 \times 3$
3

(e) $30 + 24 \div 4 - 2$
34

(f) $88 + 18 \div 3 - 4 \times 6$
70

(g) $10 + 12 \times 8 - 108 \div 9 + 6$
100

(h) $5,000 - 360,000 \div 400 + 12,000$
16,100

- 4 At a banquet, there are 45 tables that can seat 6 people and 82 tables that can seat 8 people. Write an expression to find the total number of seats, and then find the value.

$$45 \times 6 + 82 \times 8 = 926$$

926 tables

Challenge

- 5 Write +, −, or \times between each number to make each equation true.

(a) $5 \times 5 \times 5 - 5 \times 5 = 100$
Answers may vary.

(b) $1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 \times 9 = 100$

Exercise 3

Basics

In general, calculate from left to right.
If there are parentheses, find the value in parentheses first.
Do multiplication and/or division first, then addition and/or subtraction.

- 1 (a) $105 - 15 \div 3 \times 6 + 4 \div 2$
 $= 105 - \boxed{5} \times 6 + 4 \div 2$
 $= 105 - \boxed{30} + 4 \div 2$
 $= 105 - 30 + \boxed{2}$
 $= \boxed{75} + 2$
 $= \boxed{77}$
- (b) $(105 - 15 \div 3) \times (6 + 4) \div 2$
 $= (105 - \boxed{5}) \times (6 + 4) \div 2$
 $= \boxed{100} \times (6 + 4) \div 2$
 $= 100 \times \boxed{10} \div 2$
 $= \boxed{1,000} \div 2$
 $= \boxed{500}$
- (c) $(105 - 15) \div 3 \times (6 + 4 \div 2)$
 $= \boxed{90} \div 3 \times (6 + 4 \div 2)$
 $= 90 \div 3 \times (6 + \boxed{2})$
 $= 90 \div 3 \times \boxed{8}$
 $= \boxed{30} \times 8$
 $= \boxed{240}$
- (d) $105 - (15 \div 3) \times (6 + 4) \div 2$
 $= 105 - \boxed{5} \times (6 + 4) \div 2$
 $= 105 - 5 \times \boxed{10} \div 2$
 $= 105 - \boxed{50} \div 2$
 $= 105 - \boxed{25}$
 $= \boxed{80}$

Practice

- 2 Find the values.

- (a) $80 \div 8 \times 2 - 6 \div 2$
 17
- (b) $80 \div (8 \times 2 - 6) \div 2$
 4
- (c) $25 + 25 \div 5 \times 5 \div 25 - 5$
 21
- (d) $4 \times 4 \times (4 + 4 \div 4) \div 4 - 4 \times 4 \div 4$
 8
- (e) $9,000 \div (1,800 \div 30 \times 20 \div 4)$
 30
- 3 Andrei has 1,000 craft sticks. He used 250 craft sticks to make a boat. Then he made some birdhouses that each required 35 sticks for the base and 15 sticks for the roof. He used all of his craft sticks. Write an expression to find the number of birdhouses he made, and then find the value.
 $(1,000 - 250) \div (35 + 15) = 15$
 15 birdhouses

Challenge

- 4 Write +, −, ×, or ÷ in the \bigcirc to make each equation true.

- (a) $12 - 8 \div 4 \bigcirc 3 = 6$
- (b) $12 \div (8 \bigcirc 4) + 4 = 5$
- (c) $(12 - 8 \bigcirc 4) \times 4 = 0$
- (d) $12 \bigcirc (8 \bigcirc 4 \times 2) = 3$

- 5 Write +, −, ×, ÷, or () between the numbers to make each equation true.

Solutions may vary.

- (a) $(4 + 4) - (4 + 4) = 0$
- (b) $(4 + 4) \div (4 + 4) = 1$
- (c) $4 \div 4 + 4 \div 4 = 2$
- (d) $(4 + 4 + 4) \div 4 = 3$
- (e) $4 \times (4 - 4) + 4 = 4$
- (f) $(4 \times 4 + 4) \div 4 = 5$
- (g) $(4 + 4) \div 4 + 4 = 6$
- (h) $4 + 4 - 4 \div 4 = 7$
- (i) $4 + 4 + 4 - 4 = 8$
- (j) $4 \div 4 + 4 + 4 = 9$

Exercise 4

Basics

- 1 Charlotte made 11 large picture frames and 11 small picture frames using craft sticks. The large picture frames each required 75 sticks and the small frames each required 35 sticks. We can find the total number of craft sticks she used in two different ways:

$$\begin{aligned}
 11 \times (75 + 35) & \quad \text{or} \quad 11 \times 75 + 11 \times 35 \\
 = 11 \times 110 & \quad = 825 + 385 \\
 = 1,210 & \quad = 1,210
 \end{aligned}$$

Write the missing numbers.

$$11 \times (75 + 35) = \boxed{11} \times 75 + 11 \times \boxed{35}$$

- 2 $3,998 \times 45 = (4,000 - 2) \times 45$

$$\begin{aligned}
 &= \boxed{4,000} \times 45 - \boxed{2} \times 45 \\
 &= \boxed{180,000} - \boxed{90} \\
 &= \boxed{179,910}
 \end{aligned}$$

- 3 $25 \times 59 = 25 \times (60 - 1)$

$$\begin{aligned}
 &= 25 \times \boxed{60} - 25 \times \boxed{1} \\
 &= \boxed{1,500} - \boxed{25} \\
 &= \boxed{1,475}
 \end{aligned}$$

$$\begin{aligned}
 4 \quad 125 \times 8 &= (100 + \boxed{25}) \times 8 \\
 &= \boxed{100} \times 8 + \boxed{25} \times 8 \\
 &= \boxed{800} + \boxed{200} \\
 &= \boxed{1,000}
 \end{aligned}$$

Practice

- 5 Find the values. Think of ways to simplify the calculation first.

Methods may vary.

(a) 7×199

$$\begin{aligned}
 &= 7 \times 200 - 7 \times 1 \\
 &= 1,400 - 7 \\
 &= 1,393
 \end{aligned}$$

(b) $4 \times 9,125$

$$\begin{aligned}
 &= 4 \times 9,000 + 4 \times 100 + 4 \times 25 \\
 &= 36,000 + 400 + 100 \\
 &= 36,500
 \end{aligned}$$

(c) 25×38

$$\begin{aligned}
 &= 25 \times 30 + 25 \times 8 \\
 &= 750 + 200 \\
 &= 950
 \end{aligned}$$

(d) $42 \times 32 + 42 \times 68$

$$\begin{aligned}
 &= 42 \times (32 + 68) \\
 &= 42 \times 100 \\
 &= 4,200
 \end{aligned}$$

- 6 Write $>$, $<$, or $=$ in the \bigcirc to make each of the following true.

(a) $78 \times 54 \bigcirc 78 \times 50 + 78 \times 4$

(b) $8 \times 38 - 8 \times 9 \bigcirc 8 \times 28$

(c) $63 \times 5 \bigcirc (60 \times 5) - (3 \times 5)$

(d) $(700 - 3) \times 7 \bigcirc 7 \times 697$

(e) $3,009 \times 9 \bigcirc 3,000 \times 9 + 9$

(f) $27 \times 8 + 6 \times 8 \bigcirc (27 + 8) \times 6$

Challenge

- 7 (a) $7,925 \times 8 = (8,000 - 100 + \boxed{25}) \times 8$

$$\begin{aligned}
 &= \boxed{8,000} \times 8 - \boxed{100} \times 8 + \boxed{25} \times 8 \\
 &= \boxed{64,000} - \boxed{800} + \boxed{200} \\
 &= \boxed{63,400}
 \end{aligned}$$

- (b) $4,799 \times 6 = (5,000 - \boxed{200} - \boxed{1}) \times 6$

$$\begin{aligned}
 &= \boxed{5,000} \times 6 - \boxed{200} \times 6 - \boxed{1} \times 6 \\
 &= \boxed{30,000} - \boxed{1,200} - \boxed{6} \\
 &= \boxed{28,794}
 \end{aligned}$$

Exercise 5

Basics

- 1 Dana, Jett, and Charlotte used 2,085 craft sticks for their art projects. Charlotte used 215 less than 3 times as many craft sticks as Jett. Jett used 75 more craft sticks than Dana. How many craft sticks did Dana use?



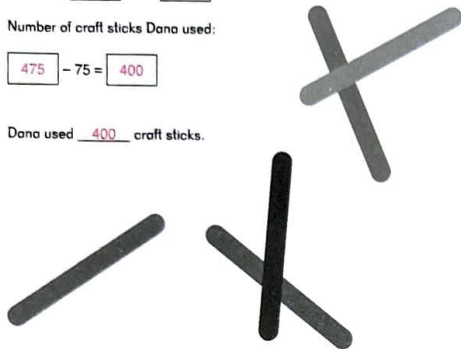
$$5 \text{ units} \rightarrow 2,085 + 215 + 75 = 2,375$$

$$1 \text{ unit} \rightarrow 2,375 \div 5 = 475$$

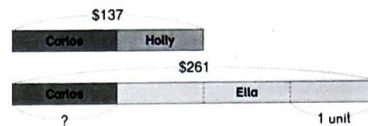
Number of craft sticks Dana used:

$$475 - 75 = 400$$

Dana used 400 craft sticks.



- 2 Holly and Carlos together have \$137. Ella and Carlos together have \$261. Ella has 3 times as much money as Holly. How much money does Carlos have?



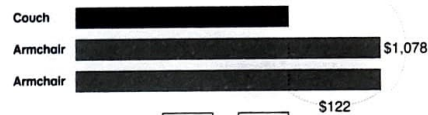
$$2 \text{ units} \rightarrow 261 - 137 = 124$$

$$1 \text{ unit} \rightarrow 124 \div 2 = 62$$

$$\text{Amount Carlos has: } 137 - 62 = 75$$

Carlos has \$ 75.

- 3 An armchair cost \$122 more than a couch. Andrei bought 2 armchairs and 1 couch for \$1,078. How much did the couch cost?



$$3 \text{ units} \rightarrow 1,078 - (2 \times 122) = 834$$

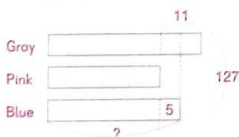
$$1 \text{ unit} \rightarrow 834 \div 3 = 278$$

The couch cost \$ 278.

Practice

Methods may vary.

- 4 The total weight of 3 full suitcases is 127 lb. The gray suitcase weighs 11 lb more than the pink suitcase. The pink suitcase weighs 5 lb less than the blue suitcase. How much does the blue suitcase weigh?

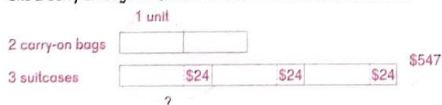


$$3 \text{ units} \rightarrow 127 + 5 - (11 - 5) = 126$$

$$1 \text{ unit} \rightarrow 126 \div 3 = 42$$

42 lb

- 5 A carry-on bag costs \$24 less than a suitcase. Janice bought 3 suitcases and 2 carry-on bags for \$547. How much does one suitcase cost?



$$5 \text{ units} \rightarrow 547 - 3 \times 24 = 475$$

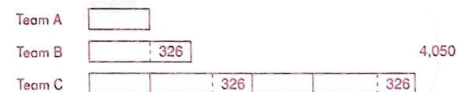
$$1 \text{ unit} \rightarrow 475 \div 5 = 95$$

$$95 + 24 = 119$$

\$119



- 6 Three teams scored 4,050 points during a competition. Team A scored 326 points less than Team B. Team C scored twice as much as Team A and Team B combined. How many points did Team B score?



$$6 \text{ units} \rightarrow 4,050 - 3 \times 326 = 3,072$$

$$1 \text{ unit} \rightarrow 3,072 \div 6 = 512$$

$$512 + 326 = 838$$

838 points

- 7 Callista bought a bag of 80 polished stones for \$19. She also bought necklace chains for \$35. She made as many necklaces as she could using the stones. Each necklace had 3 stones. She sold the necklaces for \$9 each. How much did she earn from selling the necklaces after accounting for what she spent on the material?

$$80 \div 3 = 26 \text{ R } 2$$

She made 26 necklaces.

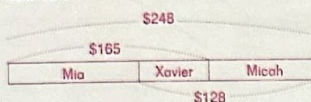
$$\text{Money from sales: } 26 \times 9 = 234$$

$$\text{Profit: } 234 - 19 - 35 = 180$$

\$180

Challenge

- 8 Mia, Xavier, and Micah have a total of \$248. Mia and Xavier together have \$165. Xavier and Micah together have \$128. How much money do each of them have?



$$\text{Overlap: } (165 + 128) - 248 = 45$$

$$\text{Xavier: } \$45$$

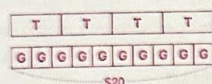
$$\text{Mia: } 165 - 45 = 120$$

$$\text{Mia: } \$120$$

$$\text{Micah: } 128 - 45 = 83$$

$$\text{Micah: } \$83$$

- 9 In a pet store, five goldfish cost as much as two tropical fish. If 10 goldfish cost \$20, how many tropical fish could someone buy for \$40?



$$5 \text{ goldfish} \rightarrow 2 \text{ tropical fish}$$

$$10 \text{ goldfish} \rightarrow 4 \text{ tropical fish}$$

$$\$20 \rightarrow 10 \text{ goldfish}$$

$$\$40 \rightarrow 20 \text{ goldfish}$$

$$20 \text{ goldfish} \rightarrow 8 \text{ tropical fish}$$

$$8 \text{ tropical fish}$$



2-5 Word Problems — Part 1

35

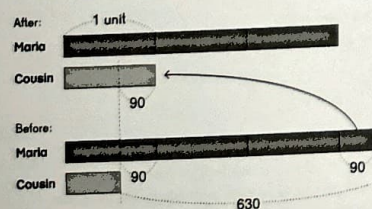
Exercise 6 • pages 36–40

Exercise 6

Basics

- 1 Maria collected 630 more ornaments than her cousin. After she gave 90 ornaments to her cousin, she had 3 times as many ornaments as her cousin. How many ornaments did Maria have at first?

Since we know that Maria had 3 times as many ornaments as her cousin after she gave ornaments to her cousin, we can draw that model first.



$$2 \text{ units} \rightarrow 630 - 2 \times 90 = 450$$

$$1 \text{ unit} \rightarrow 450 \div 2 = 225$$

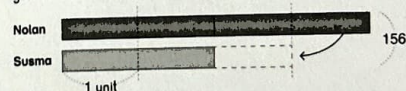
$$3 \text{ units} \rightarrow 3 \times 225 = 675$$

Number of ornaments Maria had before:

$$675 + 90 = 765$$

Maria had 765 ornaments at first.

- 2 Nolan and Susma have 156 game cards altogether. Nolan had twice as many game cards as Susma. He gave some of his game cards to Susma so that they now each have the same number of game cards. How many game cards does Susma have now?



$$6 \text{ units} \rightarrow 156$$

$$3 \text{ units} \rightarrow 156 \div 2 = 78$$

Susma now has 78 game cards.

- 3 Samuel had 4 times as many coins as Arman. They both received 34 more coins. They now have a total of 458 coins. How many coins does Arman have now?



$$5 \text{ units} \rightarrow 458 - 2 \times 34 = 390$$

$$1 \text{ unit} \rightarrow 390 \div 5 = 78$$

$$78 + 34 = 112$$

112 coins



2-6 Word Problems — Part 2

37

Exercise 7

Check

1 Find the values.

(a) $72 \div (5 + 4) \times 6$
48

(b) $42 \div 7 \times 3 - 11 + 9$
16

(c) $76 \div 24 \div 12 \times 7 - 26$
64

(d) $11 + 56 \div 8 \times 24$
179

(e) $36 \div (28 - 2 \times 8) \div 3$
1

(f) $44 - 24 \div 4 + 3 \times 5$
53

(g) $101 + 8 \times (12 - 4) - 3 + 15$
177

2-7 Practice

41

2 (a) $42 \times 87 = 42 \times 90 - 42 \times \boxed{3}$

(b) $113 \times 456 + 113 \times 544 = 113 \times \boxed{1,000}$

(c) $312 \times 3,002 = 312 \times \boxed{3,000} + \boxed{312} \times 2$

3 Use each of the given numbers once to make each equation true.
Solutions may vary.

(a) 1, 2, 3, 4

$(\boxed{1} + \boxed{2}) + (\boxed{4} - \boxed{3}) = 4$

(b) 2, 3, 4, 5

$(\boxed{5} - \boxed{4}) + (\boxed{2} \times \boxed{3}) = 7$

(c) 1, 2, 4, 5, 7

$\boxed{4} \times (\boxed{1} + \boxed{2}) = \boxed{5} + \boxed{7}$

4 2 ropes are the same length. After cutting 50 m from Rope A and 14 m from Rope B, Rope B is 3 times as long as Rope A. Find the length of Rope B.



2 units $\rightarrow 50 - 14 = 36$

1 unit $\rightarrow 36 \div 2 = 18$

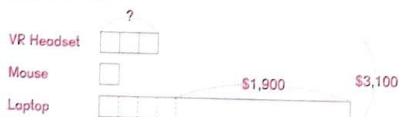
Rope B: $3 \times 18 = 54$

54 m

42

2-7 Practice

5 Diego spent \$3,100 on a laptop, a VR headset, and a gaming mouse. The laptop cost \$1,900 more than the mouse and VR headset combined. The VR headset cost 3 times as much as the mouse. How much did the VR headset cost?



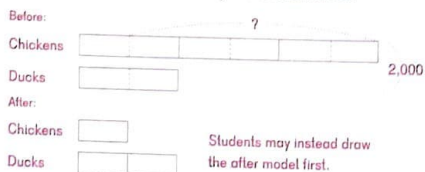
8 units $\rightarrow 3,100 - 1,900 = 1,200$

1 unit $\rightarrow 1,200 \div 8 = 150$

3 units $\rightarrow 3 \times 150 = 450$

\$450

6 Patrick had 2,000 ducks and chickens on his farm. He had 3 times as many chickens as ducks. After selling some chickens, he now has twice as many ducks as chickens. How many chickens did he sell?



8 units $\rightarrow 2,000$

1 unit $\rightarrow 2,000 \div 8 = 250$

5 units $\rightarrow 250 \times 5 = 1,250$

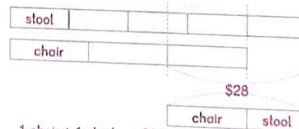
1,250 chickens

2-7 Practice

43

Challenge

7 4 stools cost as much as 3 chairs. 5 stools cost \$28 more than 2 chairs. How much do 2 stools and 2 chairs cost?



1 chair + 1 stool $\rightarrow \$28$

2 chairs + 2 stools $\rightarrow 2 \times \$28 \rightarrow \56

\$56

8 Write +, -, ×, ÷, or () between the numbers to make each equation true. Solutions may vary.

(a) $(5 + 5) \div 5 - 5 \div 5 = 1$

(b) $(5 + 5 + 5 - 5) \div 5 = 2$

(c) $5 - 5 \div 5 - 5 \div 5 = 3$

(d) $(5 + 5 + 5 + 5) \div 5 = 4$

(e) $5 + 5 - 5 + 5 - 5 = 5$

(f) $5 + 5 - 5 + 5 \div 5 = 6$

(g) $5 + 5 \div 5 + 5 \div 5 = 7$

(h) $5 + (5 + 5 + 5) \div 5 = 8$

(i) $5 + (5 \times 5 - 5) \div 5 = 9$

(j) $(5 \times 5 + 5 \times 5) \div 5 = 10$

44

2-7 Practice

Chapter 3 Multiplication and Division

Exercise 1

Basics

- 1 (a) Estimate the product of 627 and 38. *Estimates may vary.*

$$\begin{array}{r} 627 \\ \times 38 \\ \hline 5016 \\ 18810 \\ \hline 23826 \end{array}$$

- (b) Find the product of 627 and 38.

$$\begin{array}{r} 627 \\ \times 38 \\ \hline 5016 \\ 18810 \\ \hline 23826 \end{array}$$

- 2 (a) Sofia estimated the product of 819 and 26 to be 24,000. With what numbers could she have replaced each factor?
800 and 30
 (b) Emma estimated the product of 819 and 26 to be 20,000. With what numbers could she have replaced each factor?
800 and 25
 (c) Whose estimate will be closer to the actual product?
Emma's estimate
 (d) Find the product of 819 and 26. *21,294*

$$\begin{array}{r} 819 \\ \times 26 \\ \hline 4914 \\ 16380 \\ \hline 21294 \end{array}$$

3-1 Multiplying by a 2-digit Number — Part 1

45

Practice

- 3 One of these numbers is equal to 844×95 . Use estimation to determine which one, and circle it.

8,110

72,210

80,180

101,820

- 4 Which of the following gives the greatest product? Circle it.

87 × 594

6 × 5,594

12 × 1,698

- 5 Estimate, and then find the exact product. *Estimates may vary.*

(a) $79 \times 67 \approx$ 5,293

(b) $982 \times 72 \approx$ 70,704

$79 \times 67 =$ 5,293

$982 \times 72 =$ 70,704

$$\begin{array}{r} 79 \\ \times 67 \\ \hline 553 \\ 4740 \\ \hline 5293 \end{array}$$

$$\begin{array}{r} 982 \\ \times 72 \\ \hline 1964 \\ 68740 \\ \hline 70704 \end{array}$$

3-1 Multiplying by a 2-digit Number — Part 1

46

(c) $638 \times 48 \approx$ 30,624

(d) $88 \times 608 \approx$ 53,504

- 6 The manager of an apartment complex bought new washing machines and dryers for each of the 52 apartments. The washing machines cost \$398 each and the dryers cost \$367 each. What was the total cost for all of the appliances he bought?
 $52 \times (398 + 367) = 52 \times 765 = 39,780$
 \$39,780

3-1 Multiplying by a 2-digit Number — Part 1

47

- 7 (a) What is the ones digit of the product of 8 and 9?
 2

- (b) What is the ones digit of the product of 948 and 79?
 2

Challenge

- 8 To find the answer to 897×24 , Melissa multiplied 900 by 24 and then subtracted. What number did she subtract?
 900 is 3 more than 897.
 $3 \times 24 = 72$
 She subtracted 72.

- 9 Is the product of $26 \times 19 \times 87$ odd or even? What is the ones digit of the product? Find the answer without doing the complete calculation.
 Even, since one factor is even. $6 \times 9 \times 7 = 378$, so the ones digit is 8.

3-1 Multiplying by a 2-digit Number — Part 1

48

1 (a) Estimate the product of 8,427 and 58.

$$8,427 \times 58$$

$$\begin{array}{ccc} 8,427 & \times & 58 \\ \downarrow & & \downarrow \\ \boxed{8,000} & \times & \boxed{60} = \boxed{480,000} \end{array}$$

- (b) Find the product of 8,427 and 58.

$$\begin{array}{r}
 8,427 \\
 \times \quad 58 \\
 \hline
 67,416 \leftarrow 8,427 \times 8 \\
 421,350 \leftarrow 8,427 \times 50 \\
 \hline
 488,766
 \end{array}$$

2 One of these numbers is equal to $1,899 \times 89$. Use estimation to determine which one, and circle it.

126,411	169,011	1,691,011	16,480
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- 3** Which of the following give a product greater than 100,000? Circle them.

$6,427 \times 14$	$7,873 \times 39$	$15 \times 18,972$
-------------------	-------------------	--------------------

- 4** Estimate and then find the exact product. *Estimates may vary.*

(a) $7,814 \times 24 \approx$

$$7,814 \times 24 = 187,536$$

			7, 8	1	4
x				2	4
		3	1, 2	5	6
	1	5	6, 2	8	0
	1	8	7, 5	3	6

(b) $9,026 \times 81 \approx$

$$9,026 \times 81 = 731,106$$

			9	0	2	6
x					8	1
			9	0	2	6
	7	2	2	0	8	0
	7	3	1	1	0	6

(c) $9,879 \times 54 \approx$

$$9,879 \times 54 = 533,466$$

(d) $14,038 \times 37 \approx$

$$14,038 \times 37 = 519,406$$

- 5** The manager of an apartment complex bought new refrigerators, ovens, and dishwashers for each of the 52 apartments. The refrigerators cost \$598 each, the ovens cost \$388 each, and the dishwashers cost \$298 each. What is the total cost of all of these appliances?

$$52 \times (598 + 388 + 298) = 52 \times 1,284 = 66,768$$

\$66,768

6 Multiply.

- 6** Multiply.

(a) 879×406
356,874

(b) $4,027 \times 36,040$
145,133,080

Exercise 3

Check

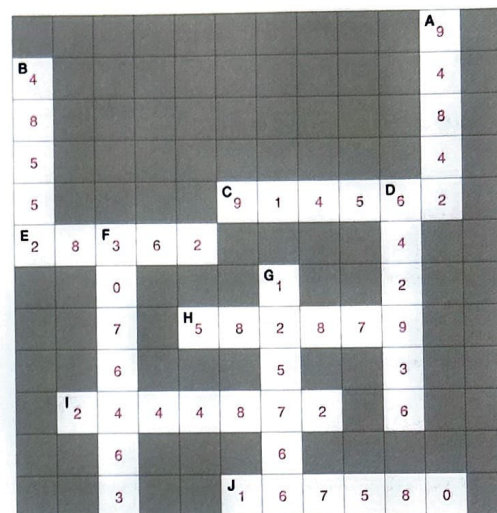
- 1 Multiply and use the answers to complete the cross number puzzle on the next page.

Across

C	9, 8, 3, 4	E	4, 8, 9	H	3, 4, 2, 8, 7
$\begin{array}{r} 9\ 8\ 3\ 4 \\ \times\ 9\ 3 \\ \hline 9\ 1\ 4\ 5\ 6\ 2 \end{array}$		$\begin{array}{r} 4\ 8\ 9 \\ \times\ 5\ 8 \\ \hline 2\ 8\ 3\ 6\ 2 \end{array}$		$\begin{array}{r} 3\ 4\ 2\ 8\ 7 \\ \times\ 1\ 7 \\ \hline 5\ 8\ 2\ 8\ 7\ 9 \end{array}$	
J	4, 7, 8, 8	I	7, 1, 9, 0, 8		
$\begin{array}{r} 4\ 7\ 8\ 8 \\ \times\ 3\ 5 \\ \hline 1\ 6\ 7\ 5\ 8\ 0 \end{array}$		$\begin{array}{r} 7\ 1\ 9\ 0\ 8 \\ \times\ 3\ 4 \\ \hline 2\ 4\ 4\ 4\ 8\ 7\ 2 \end{array}$			

Down

A	1, 4, 3, 7	B	8, 6, 7	D	7, 6, 5, 4
$\begin{array}{r} 1\ 4\ 3\ 7 \\ \times\ 6\ 6 \\ \hline 9\ 4\ 8\ 4\ 2 \end{array}$		$\begin{array}{r} 8\ 6\ 7 \\ \times\ 5\ 6 \\ \hline 4\ 8\ 5\ 5\ 2 \end{array}$		$\begin{array}{r} 7\ 6\ 5\ 4 \\ \times\ 8\ 4 \\ \hline 6\ 4\ 2\ 9\ 3\ 6 \end{array}$	
G	4, 6, 5, 8	F	3, 4, 5, 6, 7		
$\begin{array}{r} 4\ 6\ 5\ 8 \\ \times\ 2\ 7 \\ \hline 1\ 2\ 5\ 7\ 6\ 6 \end{array}$		$\begin{array}{r} 3\ 4\ 5\ 6\ 7 \\ \times\ 8\ 9 \\ \hline 3\ 0\ 7\ 6\ 4\ 6\ 3 \end{array}$			



- 2 Write $>$ or $<$ in each \bigcirc . Use estimation.

- (a) $8,268 \times 42 \bigcirc 320,000$ (b) $1,689 \times 84 \bigcirc 200 \times 900$
 (c) $2,724 \times 12 \bigcirc 270 \times 100$ (d) $394 \times 56 \bigcirc 15,873 + 8,699$
 (e) $1,198 \times 18 \bigcirc 781 \times 49$ (f) $8,107 \times 11 \bigcirc 148,107 - 62,876$

- 3 Alicia paid \$1,690 per month for rent in the first year. The second year, her rent increased by \$55 a month. How much did she pay in rent for those two years?

$$1,690 \times 12 + (1,690 + 55) \times 12 = 20,280 + 1,745 \times 12 = 20,280 + 20,940 = 41,220$$

\$41,220

- 4 The manager of an apartment complex bought water heaters for each of the 52 apartments. The water heaters each cost \$1,398. It cost \$832 to install each water heater. The electrician installing the water heaters gave a \$3,400 discount on the total. What was the cost of buying and installing the water heaters?

$$52 \times (1,398 + 832) - 3,400 = 112,560$$

\$112,560

Challenge

- 5 Look for a pattern in the following problems. Find the product for the first problem. Can you think of an easy way to find the next product by using the product of the previous expression? Explain. Then find the products for the rest for the problems.

$$5,812 \times 37 = 215,044$$

One factor increases by 3 each time.

$$5,815 \times 37 = 215,155$$

$$3 \times 37 = 111$$

Add 111 to the previous product.

$$5,818 \times 37 = 215,266$$

$$5,821 \times 37 = 215,377$$

$$5,824 \times 37 = 215,488$$

- 6 Find the missing digits.

$$\begin{array}{r} 4, \boxed{5} \boxed{1} \boxed{3} \\ \times \boxed{9} \boxed{7} \\ \hline 3 \boxed{1} \boxed{5} \boxed{9} \boxed{1} \\ 4 \boxed{6} \boxed{1} \boxed{7} \\ \hline 4 \boxed{3} \boxed{7} \boxed{7} \boxed{6} \end{array}$$

$$\begin{array}{r} 7, \boxed{0} \boxed{6} \boxed{5} \\ \times \boxed{4} \boxed{3} \\ \hline 2 \boxed{1} \boxed{1} \boxed{9} \boxed{5} \\ 2 \boxed{8} \boxed{2} \boxed{6} \boxed{0} \\ \hline 3 \boxed{3} \boxed{7} \boxed{9} \boxed{5} \end{array}$$

Exercise 4

Basics

- 1 Make groups of 4 tens.



There are 3 groups of 4 tens with 1 ten left over.

$130 \div 40$ is 3 R 10

- 2 (a) Complete the following estimations for the quotient of $400 \div 70$.

$350 \div 70 =$ 5 $420 \div 70 =$ 6

- (b) Divide 400 by 70.

7	0	4	0	0
		3	5	0
			5	0

- 3 (a) Complete the following estimations for the quotient of $896 \div 90$.

$810 \div 90 =$ 9 $900 \div 90 =$ 10

- (b) Divide 896 by 90.

9	0	8	9	6
		8	1	0
			8	6

Practice

- 4 Divide.

(a) $762 \div 80$

8	0	7	6	2
		7	2	0
			4	2

(b) $438 \div 70$

7	0	4	3	8
		4	2	0
			1	8

(c) $385 \div 50$
7 R 35

(d) $651 \div 90$
7 R 21

(e) $700 \div 80$
8 R 60

(f) $600 \div 70$
8 R 40

- 5 200 pieces of paper are distributed equally among 30 students. How many pieces of paper will each student get, and how many are left over?

$200 \div 30$ is 6 with a remainder of 20.

Each student will get 6 sheets of paper, and there will be 20 sheets left over.

- 6 Use mental calculation to find the quotients and remainders.

(a) $430 \div 70$
6 R 10

(b) $180 \div 50$
3 R 30

(c) $290 \div 30$
9 R 20

(d) $420 \div 80$
5 R 20

Challenge

- 7 What will be the ones digit of the remainder for each of these divisions?

(a) $789 \div 20$
9

(b) $972 \div 70$
2

- 8 Divide.

(a) $3,256 \div 20$
162 R 16

(b) $40,287 \div 60$
671 R 27

Exercise 5 • pages 59–60

Exercise 5

Basics

- 1 Divide 87 by 21.

Emma estimated: $80 \div 20 = 4$

$$\begin{array}{r} 4 \\ 21 \overline{) 87} \\ \underline{84} \\ 3 \end{array}$$

← 21×4

- 2 Divide 86 by 24.

Dion estimated: $80 \div 20 = 4$

$$\begin{array}{r} 4 \\ 24 \overline{) 86} \\ \underline{96} \end{array}$$

← 24×4

Too large, try 1 less.

$$\begin{array}{r} 3 \\ 24 \overline{) 86} \\ \underline{72} \\ 14 \end{array}$$

← 24×3

- 3 Divide 71 by 16.

Alex estimated: $60 \div 20 = 3$

$$\begin{array}{r} 3 \\ 16 \overline{) 71} \\ \underline{48} \\ 23 \end{array}$$

← 16×3

Too small, try 1 more.

$$\begin{array}{r} 4 \\ 16 \overline{) 71} \\ \underline{64} \\ 7 \end{array}$$

← 16×4

3-5 Divide a 2-digit Number by a 2-digit Number

59

Practice

- 4 Divide.

(a) $98 \div 31$

$$\begin{array}{r} 3 \\ 31 \overline{) 98} \\ \underline{93} \\ 5 \end{array}$$

(b) $71 \div 52$

$$\begin{array}{r} 1 \\ 52 \overline{) 71} \\ \underline{52} \\ 19 \end{array}$$

(c) $91 \div 13$

7

(d) $61 \div 22$

2 R 17

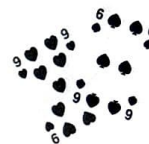
(e) $76 \div 23$

3 R 7

(f) $58 \div 14$

4 R 2

- 5 52 cards are dealt out to 12 players. How many cards does each player get? How many cards are left over?
 $52 \div 12$ is 4 with a remainder of 4.
 Each player gets 4 cards, and there are 4 cards left over.



3-5 Divide a 2-digit Number by a 2-digit Number

60

Exercise 6 • pages 61–62

Exercise 6

Basics

- 1 Divide 371 by 49.

Mei estimated: $350 \div 50 = 7$

$$\begin{array}{r} 7 \\ 49 \overline{) 371} \\ \underline{343} \\ 28 \end{array}$$

← 49×7

- 2 Divide 345 by 38.

Sofia estimated: $320 \div 40 = 8$

$$\begin{array}{r} 8 \\ 38 \overline{) 345} \\ \underline{304} \\ 41 \end{array}$$

← 38×8

Too small, try 1 more.

$$\begin{array}{r} 9 \\ 38 \overline{) 345} \\ \underline{342} \\ 3 \end{array}$$

← 38×9

- 3 Divide 165 by 24.

Emma estimated: $160 \div 20 = 8$

$$\begin{array}{r} 8 \\ 24 \overline{) 165} \\ \underline{192} \end{array}$$

← 24×8

Too large, try 7.

$$\begin{array}{r} 7 \\ 24 \overline{) 165} \\ \underline{168} \end{array}$$

← 24×7

Too large, try 6.

$$\begin{array}{r} 6 \\ 24 \overline{) 165} \\ \underline{144} \\ 21 \end{array}$$

← 24×6

3-6 Divide a 3-digit Number by a 2-digit Number — Part 1

61

Practice

- 4 Divide.

(a) $653 \div 86$

$$\begin{array}{r} 7 \\ 86 \overline{) 653} \\ \underline{602} \\ 51 \end{array}$$

(b) $511 \div 73$

$$\begin{array}{r} 7 \\ 73 \overline{) 511} \\ \underline{511} \\ 0 \end{array}$$

(c) $389 \div 47$

8 R 13

(d) $815 \div 82$

9 R 77

(e) $320 \div 53$

6 R 2

(f) $406 \div 68$

5 R 66

- 5 A farmer collected 195 eggs. He put some of them into 2 cartons of 12, and put the rest into cartons of 18. How many full cartons of 18 did he have?
 $195 - (2 \times 12) = 171$
 $171 \div 18$ is 9 with a remainder of 9.
 9 full cartons



3-6 Divide a 3-digit Number by a 2-digit Number — Part 1

62

Exercise 7

Basics

- 1 Divide 893 by 28.

89 is greater than 28, so the quotient will start in the tens place.

Divide 89 tens by 28.
90 tens \div 30 = 3 tens. Try 3 tens.

$$\begin{array}{r} 3 \\ 28 \overline{) 893} \\ \underline{84} \leftarrow 28 \times 3 \text{ tens} \\ 53 \end{array}$$

Divide 53 by 28.
 $60 \div 30 = 2$. Since $28 \times 2 = 56$, 2 is too large. Try 1.

$$\begin{array}{r} 31 \\ 28 \overline{) 893} \\ \underline{84} \\ 53 \\ \underline{28} \\ 25 \end{array}$$

Check your answer: $28 \times 31 + 25 = 868 + 25 = 893$

- 2 Divide 852 by 21.

$$\begin{array}{r} 40 \\ 21 \overline{) 852} \\ \underline{84} \\ 12 \end{array}$$

Check your answer: $21 \times 40 + 12 = 840 + 12 = 852$

3-7 Divide a 3-digit Number by a 2-digit Number — Part 2

63

Practice

- 3 In each of the following problems, put a check mark in the place where the quotient will start.

(a) $24 \overline{) 590}$

(b) $43 \overline{) 902}$

(c) $63 \overline{) 570}$

(d) $56 \overline{) 553}$

- 4 Divide.

(a) $971 \div 29$

$$\begin{array}{r} 33 \\ 29 \overline{) 971} \\ \underline{87} \\ 101 \\ \underline{87} \\ 14 \end{array}$$

(b) $702 \div 29$

$$\begin{array}{r} 24 \\ 29 \overline{) 702} \\ \underline{58} \\ 122 \\ \underline{116} \\ 6 \end{array}$$

(c) $772 \div 37$
20 R 32

(d) $945 \div 15$
63

3-7 Divide a 3-digit Number by a 2-digit Number — Part 2

64

- 5 The area of a rectangle is 444 in^2 . One side measures 1 foot. What is the length of the other side in inches?

$$444 \div 12 = 37$$

37 inches

Challenge

- 6 To divide 851 by 16, Alex first estimated that the tens digit of the quotient was 4. When he found it was too small (since the remainder was 21) he replaced the tens digit of the quotient with a 5. Instead of then erasing the 64 and multiplying 16 by 5 and then finding the new remainder, he subtracted 16 from the 21 and then proceeded. Does this work, and if so, why?

$$\begin{array}{r} 53 \\ 16 \overline{) 851} \\ \underline{64} \\ 21 \\ \underline{16} \\ 51 \\ \underline{48} \\ 3 \end{array}$$

It works. The 16×5 is 16 more than 16×4 , so the remainder will be 16 less. Had he calculated 16×5 to get 80 and subtracted, he would have also gotten a remainder of 3.

3-7 Divide a 3-digit Number by a 2-digit Number — Part 2

65

Exercise 8

Basics

- 1 (a) Divide 787 by 32.

$$\begin{array}{r} 24 \\ 32 \overline{) 787} \\ \underline{64} \\ 147 \\ \underline{128} \\ 19 \end{array}$$

- (b) Divide 7,876 by 32.

$$\begin{array}{r} 246 \\ 32 \overline{) 7876} \\ \underline{64} \\ 147 \\ \underline{128} \\ 196 \\ \underline{192} \\ 4 \end{array}$$

- (c) Check your answer for $7,876 \div 32$:
 $32 \times 246 + 4 = 7,872 + 4 = 7,876$

- 2 (a) Divide 941 by 23.

$$\begin{array}{r} 40 \\ 23 \overline{) 941} \\ \underline{92} \\ 21 \end{array}$$

- (b) Divide 9,413 by 23.

$$\begin{array}{r} 409 \\ 23 \overline{) 9413} \\ \underline{92} \\ 213 \\ \underline{207} \\ 6 \end{array}$$

- (c) Check your answer for $9,413 \div 23$:
 $23 \times 409 + 6 = 9,407 + 6 = 9,413$

- 3 (a) Divide 487 by 52.

$$\begin{array}{r} 9 \\ 52 \overline{) 487} \\ \underline{46} \\ 27 \\ \underline{208} \\ 69 \end{array}$$

- (b) Divide 4,872 by 52.

$$\begin{array}{r} 93 \\ 52 \overline{) 4872} \\ \underline{46} \\ 27 \\ \underline{208} \\ 69 \\ \underline{656} \\ 36 \end{array}$$

- (c) Check your answer for $4,872 \div 52$:
 $52 \times 93 + 36 = 4,836 + 36 = 4,872$

Practice

- 4 In each of the following problems, put a check mark in the place where the quotient will start.

(a) $4 \overline{) 8,827}$

(b) $6 \overline{) 5,907}$

(c) $3 \overline{) 6,809}$

(d) $4 \overline{) 4,232}$

- 5 Divide.

(a) $7,716 \div 19$
 $406 \text{ R } 2$

(b) $8,072 \div 28$
 $288 \text{ R } 8$

(c) $5,728 \div 63$
 $90 \text{ R } 58$

(d) $9,285 \div 15$
 619

(e) $7,056 \div 85$
 $83 \text{ R } 1$

(f) $8,297 \div 60$
 $138 \text{ R } 17$

Exercise 9

Check

1 Divide.

(a) $889 \div 30$
29 R 19

(b) $460 \div 53$
8 R 36

(c) $982 \div 28$
35 R 2

(d) $1,010 \div 11$
91 R 9

(e) $8,932 \div 29$
308

(f) $6,285 \div 18$
349 R 3

3-9 Practice B

69

2 Write $>$ or $<$ in each \bigcirc . Use estimation.

(a) $937 \div 8 \bigcirc 3,270 \div 40$

(b) $5,938 \div 62 \bigcirc 4,812 \div 36$

(c) $8,908 \div 17 \bigcirc 132 \times 7$

(d) $8,107 \div 11 \bigcirc 128,107 - 72,876$

3 Express 152 ounces as pounds and ounces.

$152 \div 16$ is 9 R 8

9 lb 8 oz

4 Lee's pickup truck can carry up to 1,500 lb. Lee weighs 195 lb and there are 45 lb of other contents in the truck. How many 94-pound bags of cement can the truck carry?

$1,500 - 195 - 45 = 1,260$

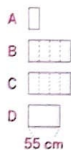
$1,260 \div 94$ is 13 R 38

13 bags

70

3-9 Practice B

5 A rope 10 m long is cut into 4 parts. Part B is 4 times as long as Part A, and Part C is 4 times as long as part B. Part D is 55 cm long. How long is Part C?



21 units $\rightarrow 1,000 - 55 = 945$

1 unit $\rightarrow 945 \div 21 = 45$

16 units $\rightarrow 16 \times 45 = 720$

720 cm

6 The manager of a new apartment complex with 12 apartments spent \$8,190 on bathroom and kitchen sinks for each unit. Half of the units had 2 bathrooms. Each kitchen sink cost twice as much as each bathroom sink. What was the cost of 1 bathroom sink?

Number of bathroom sinks needed: $12 \div 2 = 6$

12 kitchen sinks cost the same as 24 bathroom sinks.

$18 + 24 = 42$

$8,190 \div 42 = 195$

\$195

3-9 Practice B

71

Challenge

7 When a 3 digit number is divided by 11, the remainder is greater than the quotient. What is the number?

The number is 109.

The remainder must be 10 or less. So the quotient must be 9 or less.

Try a quotient of 9 with a remainder of 10: $9 \times 11 + 10 = 109$

Try a quotient of 8 with a remainder of 10: $8 \times 11 + 10 = 98$, which is not a 3-digit number, which would also be the case for a remainder of 9 or any quotient less than 8.

8 When 165 is divided by a 2-digit divisor, the remainder is 30. What is the divisor?

$165 = \text{divisor} \times \text{quotient} + 30$

$165 - 30 = 135$ must be divisible by the divisor.

The factors of 135 are 1, 3, 5, 9, 15, 27, 45, and 135.

The divisor cannot be less than the remainder.

The divisor must be 45.

9 Find the missing digits.

(a)
$$\begin{array}{r} 55 \\ 15 \overline{) 825} \\ \underline{75} \\ 75 \\ \underline{75} \\ 0 \end{array}$$

2-digit divisor $\times 8$
= 2-digit product, so divisor must be 10, 11, or 12.

(b)
$$\begin{array}{r} 809 \\ 129 \overline{) 1080} \\ \underline{96} \\ 108 \\ \underline{108} \\ 0 \end{array}$$

3 digits, so divisor must be 12 and the ones digit of the quotient must be 9.
Tens digit of quotient must be 0.

72

3-9 Practice B

Chapter 4 Addition and Subtraction of Fractions

Exercise 1

Basics

- 1 (a) Divide 2 by 5.



$$2 \div 5 = \frac{2}{5}$$

- (b) Divide 37 by 5.

$$\begin{array}{r} 7 \\ 5 \overline{) 37} \\ \underline{35} \\ 2 \end{array}$$

37 ÷ 5 is 7 with a remainder of 2.

Divide the remainder by 5: $2 \div 5 = \frac{2}{5}$

$$37 \div 5 = 7 + \frac{2}{5} = 7\frac{2}{5}$$

- (c) Divide 762 by 5. Express the answer as a mixed number.

$$\begin{array}{r} 152 \\ 5 \overline{) 762} \\ \underline{5} \\ 26 \\ \underline{25} \\ 12 \\ \underline{10} \\ 2 \end{array}$$

$$762 \div 5 = 152\frac{2}{5}$$

- 2 Express $\frac{15}{2}$ as a mixed number in simplest form.

$$\frac{15}{2} = 7\frac{1}{2}$$

- 3 Express $\frac{63}{4}$ as a mixed number in simplest form.

$$\frac{63}{4} = 63 \div 4 = 15\frac{3}{4}$$

$$\begin{array}{r} 15 \\ 4 \overline{) 63} \\ \underline{4} \\ 23 \\ \underline{20} \\ 3 \end{array}$$

- 4 Express $\frac{146}{12}$ as a mixed number in simplest form.

(a) $\frac{146}{12} = 146 \div 12 = 12\frac{2}{12} = 12\frac{1}{6}$

$$\begin{array}{r} 12 \\ 12 \overline{) 146} \\ \underline{144} \\ 2 \end{array}$$

- (b) Simplify $\frac{146}{12}$ and then express it as a mixed number.

$$\frac{146}{12} = \frac{73}{6} = 12\frac{1}{6}$$

$$\begin{array}{r} 12 \\ 6 \overline{) 73} \\ \underline{72} \\ 1 \end{array}$$

- 5 $140 \div 21 = 20 + 3 = 6\frac{2}{3}$

Practice

- 6 Express each fraction as a mixed number in simplest form.

(a) $\frac{99}{5} = 19\frac{4}{5}$

(b) $\frac{250}{6} = 41\frac{2}{3}$

(c) $\frac{119}{14} = 8\frac{1}{2}$

(d) $\frac{740}{15} = 49\frac{1}{3}$

- 7 Divide. Express each answer as a mixed number in simplest form.

(a) $35 \div 4 = 8\frac{3}{4}$

(b) $930 \div 8 = 116\frac{1}{4}$

(c) $260 \div 25 = 10\frac{2}{5}$

(d) $4,900 \div 90 = 54\frac{4}{9}$

- 8 How many pounds is 100 ounces?

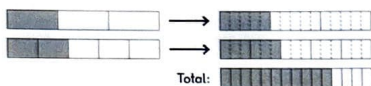
$$100 \div 16 = 6\frac{1}{4}$$

$6\frac{1}{4}$ lb

Exercise 2

Basics

- 1 Add $\frac{1}{3}$ and $\frac{2}{5}$.



$$\frac{1}{3} + \frac{2}{5} = \frac{5}{15} + \frac{6}{15} = \frac{11}{15}$$

- 2 Add $\frac{1}{8}$ and $\frac{1}{6}$.

(a) $8 \times 6 = 48$. 48 is a common multiple of 8 and 6.

$$\frac{1}{8} + \frac{1}{6} = \frac{6}{48} + \frac{8}{48} = \frac{14}{48} = \frac{7}{24}$$

(b) The least common multiple of 8 and 6 is 24.

$$\frac{1}{8} + \frac{1}{6} = \frac{3}{24} + \frac{4}{24} = \frac{7}{24}$$

- 3 Add $\frac{1}{14}$ and $\frac{2}{3}$.

$$\frac{1}{14} + \frac{2}{3} = \frac{3}{42} + \frac{28}{42} = \frac{31}{42}$$

Practice

- 4 Add. Express each answer in simplest form.

(a) $\frac{3}{4} + \frac{3}{20} = \frac{15}{20} + \frac{3}{20} = \frac{18}{20} = \frac{9}{10}$

(b) $\frac{1}{6} + \frac{3}{10} = \frac{5}{30} + \frac{9}{30} = \frac{14}{30} = \frac{7}{15}$

(c) $\frac{1}{6} + \frac{4}{15} = \frac{5}{30} + \frac{16}{30} = \frac{21}{30} = \frac{7}{10}$

(d) $\frac{5}{12} + \frac{3}{4} = \frac{5}{12} + \frac{9}{12} = \frac{14}{12} = 1\frac{1}{3}$

(e) $\frac{6}{7} + \frac{1}{2} = \frac{12}{14} + \frac{7}{14} = \frac{19}{14} = 1\frac{5}{14}$

(f) $\frac{5}{8} + \frac{8}{9} = \frac{45}{72} + \frac{64}{72} = \frac{109}{72} = 1\frac{37}{72}$

(g) $\frac{1}{2} + \frac{2}{5} + \frac{1}{3} = \frac{15}{30} + \frac{12}{30} + \frac{10}{30} = \frac{37}{30} = 1\frac{7}{30}$

(h) $\frac{3}{4} + \frac{5}{6} + \frac{2}{3} = \frac{9}{12} + \frac{10}{12} + \frac{8}{12} = \frac{27}{12} = 2\frac{1}{4}$

- 5 Jaiden practiced the violin for $\frac{2}{3}$ h on Monday, $\frac{5}{6}$ h on Tuesday, and $\frac{3}{4}$ h each on Wednesday and Thursday. How long did he practice the violin altogether?

$$\frac{2}{3} + \frac{5}{6} + \frac{3}{4} + \frac{3}{4} = \frac{4}{6} + \frac{5}{6} + \frac{3}{4} + \frac{3}{4} = \frac{9}{6} + \frac{6}{4} = \frac{3}{2} + \frac{3}{2} = \frac{6}{2} = 3$$

3 h



Challenge

- 6 Complete each problem using the given digits. Fractions should all be less than 1 and in simplest form.

(a) 1, 2, 5, 9

$$\frac{1}{2} + \frac{2}{5} = \frac{9}{10}$$

(b) 1, 2, 2, 5, 10

$$\frac{1}{2} + \frac{2}{5} = \frac{9}{10}$$

(c) 1, 7, 8, 12, 24

$$\frac{7}{24} + \frac{1}{8} = \frac{5}{12}$$

Exercise 3

Basics

- 1 Subtract $\frac{1}{4}$ from $\frac{5}{6}$.



$$\frac{5}{6} - \frac{1}{4} = \frac{10}{12} - \frac{3}{12} = \frac{7}{12}$$

- 2 Subtract $\frac{7}{10}$ from $\frac{5}{6}$.

(a) $6 \times 10 = 60$. 60 is a common multiple of 6 and 10.

$$\frac{5}{6} - \frac{7}{10} = \frac{5 \times 10}{6 \times 10} - \frac{7 \times 6}{10 \times 6} = \frac{50}{60} - \frac{42}{60} = \frac{8}{60} = \frac{2}{15}$$

(b) The least common multiple of 6 and 10 is 30.

$$\frac{5}{6} - \frac{7}{10} = \frac{5 \times 5}{6 \times 5} - \frac{7 \times 3}{10 \times 3} = \frac{25}{30} - \frac{21}{30} = \frac{4}{30} = \frac{2}{15}$$

- 3 Subtract $\frac{5}{16}$ from 1.

$$1 - \frac{5}{16} = \frac{16}{16} - \frac{5}{16} = \frac{11}{16}$$

Practice

- 4 Subtract. Express each answer in simplest form.

(a) $\frac{3}{5} - \frac{3}{15} = \frac{2}{5}$ (b) $\frac{3}{4} - \frac{5}{12} = \frac{1}{3}$

(c) $\frac{1}{2} - \frac{3}{7} = \frac{1}{14}$ (d) $\frac{7}{12} - \frac{3}{8} = \frac{5}{24}$

(e) $\frac{1}{6} - \frac{1}{10} = \frac{1}{15}$ (f) $1 - \frac{6}{21} = \frac{5}{7}$

(g) $1 - \frac{2}{5} - \frac{1}{3} = \frac{4}{15}$ (h) $\frac{7}{8} - \frac{1}{6} - \frac{2}{3} = \frac{1}{24}$

- 5 Louis bought $\frac{3}{4}$ kg of flour. He used $\frac{3}{10}$ kg to bake bread. How many kilograms of flour does he have left?

$$\frac{3}{4} - \frac{3}{10} = \frac{30}{40} - \frac{12}{40} = \frac{18}{40} = \frac{9}{20}$$

$\frac{9}{20}$ kg



Challenge

- 6 Study the following examples.

$$\frac{1}{2} - \frac{1}{3} = \frac{1 \times 3}{2 \times 3} - \frac{1 \times 2}{3 \times 2} = \frac{3-2}{2 \times 3} = \frac{1}{6}$$

$$\frac{1}{3} - \frac{1}{4} = \frac{1 \times 4}{3 \times 4} - \frac{1 \times 3}{4 \times 3} = \frac{4-3}{3 \times 4} = \frac{1}{12}$$

$$\frac{1}{4} - \frac{1}{5} = \frac{1 \times 5}{4 \times 5} - \frac{1 \times 4}{5 \times 4} = \frac{5-4}{4 \times 5} = \frac{1}{20}$$

Use a quick method to find the following values.

(a) $\frac{1}{9} - \frac{1}{10}$

$$\frac{10-9}{9 \times 10} = \frac{1}{90}$$

(b) $\frac{1}{99} - \frac{1}{100}$

$$\frac{100-99}{99 \times 100} = \frac{1}{9,900}$$

(c) $\frac{1}{19} - \frac{1}{20}$

$$\frac{20-19}{19 \times 20} = \frac{1}{380}$$

Exercise 4

Check

1 Express each fraction as a mixed number in simplest form.

(a) $\frac{26}{6} = 4\frac{1}{3}$

(b) $\frac{50}{8} = 6\frac{1}{4}$

(c) $\frac{455}{25} = 18\frac{1}{5}$

(d) $\frac{1,220}{100} = 12\frac{1}{5}$

2 Divide. Express each answer as a mixed number in simplest form.

(a) $98 \div 3 = 32\frac{2}{3}$

(b) $100 \div 80 = 1\frac{1}{4}$

(c) $500 \div 6 = 83\frac{1}{3}$

(d) $155 \div 15 = 10\frac{1}{3}$

3 Find the values. Express each answer in simplest form.

(a) $\frac{2}{3} + \frac{1}{8} = \frac{19}{24}$

(b) $\frac{7}{15} + \frac{5}{6} = 1\frac{3}{10}$

(c) $\frac{9}{10} - \frac{2}{3} = \frac{7}{30}$

(d) $\frac{11}{12} - \frac{5}{9} = \frac{13}{36}$

(e) $\frac{9}{10} - (\frac{1}{3} + \frac{1}{2}) = \frac{1}{15}$

(f) $\frac{9}{10} - \frac{1}{3} + \frac{1}{2} = 1\frac{1}{15}$

(g) $\frac{2}{5} - (\frac{2}{5} - \frac{1}{3}) = \frac{1}{3}$

(h) $\frac{9}{14} + \frac{2}{3} - \frac{1}{7} = 1\frac{1}{6}$

4 $\frac{1}{5}$ of a pole is painted green, $\frac{1}{3}$ of it is painted yellow, and $\frac{1}{6}$ of it is painted blue. The rest of it is painted red. What fraction of the pole is painted red?

$$1 - \frac{1}{5} - \frac{1}{3} - \frac{1}{6} = \frac{30}{30} - \frac{6}{30} - \frac{10}{30} - \frac{5}{30} = \frac{9}{30} = \frac{3}{10}$$

5 Elena had 12 kg of flour. She used $\frac{1}{2}$ kg for bread, $\frac{1}{3}$ kg for rolls, and $\frac{1}{6}$ kg for cake. She then divided the rest of the flour into 5 containers. How much flour is in each container?

$$\frac{1}{2} + \frac{1}{3} + \frac{1}{6} = \frac{6}{12} + \frac{4}{12} + \frac{2}{12} = 1$$

$$12 - 1 = 11$$

$$\frac{11}{5} = 2\frac{1}{5}$$

$2\frac{1}{5}$ kg

Challenge

6 Find the value.

$$\frac{1}{2} - \frac{1}{3} + \frac{1}{4} - \frac{1}{4} + \frac{1}{5} - \frac{1}{5} + \frac{1}{6} - \frac{1}{6} + \frac{1}{7} = \frac{5}{14}$$

Exercise 5

Basics

- 1 Fill in the blanks for each problem. Each problem uses a different strategy to add the given numbers.

$$\begin{aligned} \text{(a)} \quad 8\frac{2}{3} + \frac{3}{4} &= 8\frac{\boxed{8}}{12} + \frac{\boxed{9}}{12} \\ &= 8\frac{\boxed{17}}{12} \\ &= 9\frac{\boxed{5}}{12} \end{aligned}$$

$$\begin{aligned} \text{(b)} \quad 5\frac{1}{2} + \frac{5}{8} &= 5\frac{4}{8} + \frac{\boxed{5}}{8} \\ &= 5\frac{4}{8} + \frac{4}{8} + \frac{\boxed{1}}{8} \\ &= 6\frac{\boxed{1}}{8} \end{aligned}$$

$$\begin{aligned} \text{(c)} \quad 1\frac{1}{3} + \frac{3}{5} &= \frac{\boxed{4}}{3} + \frac{3}{5} \\ &= \frac{\boxed{20}}{15} + \frac{\boxed{9}}{15} \\ &= \frac{\boxed{29}}{15} \\ &= 1\frac{\boxed{14}}{15} \end{aligned}$$

Practice

- 2 Add. Use any method. Express each answer in simplest form.

$$\text{(a)} \quad 4\frac{4}{9} + \frac{5}{9} \quad 5 \qquad \text{(b)} \quad 6\frac{5}{12} + \frac{11}{12} \quad 7\frac{1}{3}$$

$$\text{(c)} \quad 3\frac{7}{8} + \frac{3}{4} \quad 4\frac{5}{8} \qquad \text{(d)} \quad \frac{2}{5} + 8\frac{1}{4} \quad 8\frac{13}{20}$$

$$\text{(e)} \quad \frac{5}{9} + 4\frac{1}{2} \quad 5\frac{1}{18} \qquad \text{(f)} \quad 9\frac{5}{8} + \frac{2}{3} \quad 10\frac{7}{24}$$

$$\text{(g)} \quad \frac{3}{4} + \frac{1}{2} + 1\frac{5}{8} \quad 2\frac{7}{8} \qquad \text{(h)} \quad \frac{1}{3} + 3\frac{1}{6} + \frac{3}{4} \quad 4\frac{1}{4}$$

Exercise 6

Basics

- 1 Fill in the blanks for each problem.

$$(a) 3\frac{7}{12} + 4\frac{2}{3} = 7\frac{7}{12} + \frac{2}{3}$$

$$= 7\frac{7}{12} + \frac{8}{12}$$

$$= 7\frac{15}{12}$$

$$= \frac{8}{12} + \frac{3}{12}$$

$$= \frac{8}{4} + \frac{1}{4}$$

$$(b) 1\frac{1}{2} + 2\frac{4}{5} = \frac{3}{2} + \frac{14}{5}$$

$$= \frac{15}{10} + \frac{28}{10}$$

$$= \frac{43}{10}$$

$$= 4\frac{3}{10}$$

Practice

- 2 Add. Use any method. Express each answer in simplest form.

$$(a) 4\frac{3}{8} + 2\frac{5}{8} = 7$$

$$(b) 4\frac{5}{7} + 4\frac{3}{7} = 9\frac{1}{7}$$

$$(c) 1\frac{1}{6} + 9\frac{7}{12} = 10\frac{3}{4}$$

$$(d) 3\frac{9}{11} + 2\frac{1}{2} = 6\frac{7}{22}$$

$$(e) 3\frac{9}{10} + 3\frac{5}{6} = 7\frac{11}{15}$$

$$(f) 12\frac{5}{6} + 7\frac{3}{8} = 20\frac{5}{24}$$

$$(g) 2\frac{1}{3} + \frac{3}{5} + 3\frac{2}{5} = 6\frac{1}{3}$$

$$(h) 2\frac{1}{2} + 3\frac{1}{3} + 4\frac{1}{4} + 5\frac{1}{5} + 6\frac{1}{6} = 21\frac{9}{20}$$

- 3 Last week, Calli bought $3\frac{3}{4}$ m of cloth. This week, she bought $1\frac{1}{5}$ m more cloth than what she bought last week. How many meters of cloth did she buy altogether?

$$3\frac{3}{4} + 3\frac{3}{4} + 1\frac{1}{5} = 8\frac{7}{10}$$

$$8\frac{7}{10} \text{ m}$$

Challenge

- 4 Use each of the digits 0 to 9 once to form two mixed numbers with a sum of 100.

This is one possible solution:

$$29\frac{1}{3} + 70\frac{56}{64}$$

Find another solution.

Some possible solutions:

$$50\frac{1}{2} + 49\frac{38}{76}$$

$$78\frac{3}{6} + 21\frac{45}{90}$$

Exercise 7 • pages 90–91

Exercise 7

Basics

- 1 Fill in the blanks for each problem. Each problem uses a different strategy to subtract the given numbers.

$$\begin{aligned} \text{(a)} \quad 7\frac{1}{3} - 4\frac{3}{4} &= 7\frac{4}{12} - \frac{9}{12} \\ &= 6\frac{16}{12} - \frac{9}{12} \\ &= 6\frac{7}{12} \end{aligned}$$

$$\begin{aligned} \text{(b)} \quad 3\frac{5}{6} - 2\frac{1}{3} &= 3\frac{5}{6} - \frac{2}{6} \\ &= 2\frac{1}{3} + \frac{1}{6} \\ &= 2\frac{3}{9} + \frac{1}{6} \\ &= 2\frac{5}{9} \end{aligned}$$

$$\begin{aligned} \text{(c)} \quad 2\frac{1}{4} - 1\frac{5}{8} &= \frac{9}{4} - \frac{5}{8} \\ &= \frac{63}{28} - \frac{20}{28} \\ &= \frac{43}{28} \\ &= 1\frac{15}{28} \end{aligned}$$

90

4-7 Subtracting Mixed Numbers — Part 1

Practice

- 2 Subtract. Use any method. Express each answer in simplest form.

$$\text{(a)} \quad 7\frac{4}{7} - \frac{5}{7}$$

$$6\frac{6}{7}$$

$$\text{(b)} \quad 6\frac{5}{12} - \frac{5}{12}$$

$$6\frac{5}{12}$$

$$\text{(c)} \quad 8\frac{5}{12} - \frac{1}{4}$$

$$8\frac{1}{6}$$

$$\text{(d)} \quad 4\frac{1}{3} - \frac{5}{6}$$

$$3\frac{1}{2}$$

$$\text{(e)} \quad 5\frac{7}{10} - \frac{5}{6}$$

$$4\frac{13}{15}$$

$$\text{(f)} \quad 9\frac{2}{15} - \frac{5}{6}$$

$$8\frac{3}{10}$$

$$\text{(g)} \quad 12 - \frac{3}{5} - \frac{1}{2}$$

$$10\frac{9}{10}$$

$$\text{(h)} \quad 8\frac{1}{3} - \frac{5}{6} - \frac{2}{5}$$

$$7\frac{5}{18}$$

4-7 Subtracting Mixed Numbers — Part 1

91

Exercise 8 • pages 92–93

Exercise 8

Basics

- 1 Fill in the blanks for each problem.

$$\begin{aligned} \text{(a)} \quad 7\frac{7}{12} - 3\frac{3}{4} &= 4\frac{7}{12} - \frac{3}{4} \\ &= 4\frac{7}{12} - \frac{9}{12} \\ &= 3\frac{19}{12} - \frac{9}{12} \\ &= 3\frac{10}{12} \\ &= 3\frac{5}{6} \end{aligned}$$

$$\begin{aligned} \text{(b)} \quad 2\frac{3}{4} - 1\frac{1}{12} &= \frac{11}{4} - \frac{13}{12} \\ &= \frac{33}{12} - \frac{13}{12} \\ &= \frac{20}{12} \\ &= \frac{5}{3} \\ &= 1\frac{2}{3} \end{aligned}$$

92

4-8 Subtracting Mixed Numbers — Part 2

Practice

- 2 Subtract. Use any method. Express each answer in simplest form.

$$\text{(a)} \quad 4\frac{3}{8} - 2\frac{5}{8}$$

$$1\frac{3}{4}$$

$$\text{(b)} \quad 7\frac{9}{14} - 2\frac{3}{7}$$

$$5\frac{3}{14}$$

$$\text{(c)} \quad 9\frac{3}{8} - 6\frac{7}{12}$$

$$2\frac{19}{24}$$

$$\text{(d)} \quad 2\frac{2}{9} - 1\frac{2}{3}$$

$$\frac{5}{9}$$

$$\text{(e)} \quad 6\frac{5}{6} - 3\frac{3}{10}$$

$$3\frac{8}{15}$$

$$\text{(f)} \quad 12\frac{3}{9} - 7\frac{5}{6}$$

$$4\frac{1}{2}$$

$$\text{(g)} \quad 12\frac{1}{3} - 3 - 2\frac{3}{5}$$

$$6\frac{11}{15}$$

$$\text{(h)} \quad 7\frac{1}{4} - 2\frac{1}{5} - 2\frac{3}{10}$$

$$2\frac{3}{4}$$

4-8 Subtracting Mixed Numbers — Part 2

93

Exercise 9

Check

- 1 Find the values. Express each answer in simplest form.

(a) $4\frac{3}{8} - \frac{3}{4}$ $3\frac{5}{8}$ (b) $7\frac{4}{5} + \frac{4}{15}$ $8\frac{1}{15}$

(c) $9\frac{3}{8} + 2\frac{5}{12}$ $11\frac{19}{24}$ (d) $3\frac{3}{7} - 1\frac{1}{2}$ $1\frac{13}{14}$

(e) $9\frac{1}{3} - (3\frac{5}{6} - 2\frac{1}{2})$ 8 (f) $9\frac{1}{3} - 3\frac{5}{6} - 2\frac{1}{2}$ 3

2 (a) $2\frac{11}{12} + 2\frac{1}{3} = 5\frac{1}{4}$ (b) $8\frac{2}{3} - 3\frac{1}{2} = 5\frac{1}{6}$

- 3 A container has $4\frac{3}{5}$ L of water. $1\frac{7}{10}$ L is needed to fill it to full capacity. What is the capacity of the container in liters?

$$4\frac{3}{5} + 1\frac{7}{10} = 6\frac{3}{10}$$

$$6\frac{3}{10} \text{ L}$$

- 4 Wainani's time for running 100 m was $18\frac{1}{3}$ seconds. Taylor's time was $3\frac{4}{5}$ s less than Wainani's time. What was Taylor's time for running 100 m?

$$18\frac{1}{3} - 3\frac{4}{5} = 14\frac{8}{15}$$

$$14\frac{8}{15} \text{ s}$$

- 5 To make blended coffee, a barista mixed 12 lb of beans from Ecuador with 15 lb of beans from Kenya. He then divided the blend into 8 equal portions and added $1\frac{3}{4}$ lb of beans from Colombia to each bag. What is the weight of coffee in each bag?

$$(12 + 15) \div 8 = 3\frac{3}{8}$$

$$3\frac{3}{8} + 1\frac{3}{4} = 5\frac{1}{8}$$

$$5\frac{1}{8} \text{ lb}$$



- 6 A rectangle is $3\frac{1}{4}$ ft long and $2\frac{1}{3}$ ft wide. What is the perimeter in feet?

$$3\frac{1}{4} + 3\frac{1}{4} + 2\frac{1}{3} + 2\frac{1}{3} = 11\frac{1}{6}$$

$$11\frac{1}{6} \text{ ft}$$

- 7 A spider climbed $7\frac{1}{4}$ inches up a wall, then slid down $1\frac{1}{2}$ inches, and then climbed another $5\frac{3}{8}$ inches. How much higher did the spider end up from its starting place?

$$7\frac{1}{4} - 1\frac{1}{2} + 5\frac{3}{8} = 11\frac{1}{8}$$

$$11\frac{1}{8} \text{ in}$$



Challenge

- 8 Find the value.

$$10\frac{1}{7} - 9\frac{1}{8} + 9\frac{1}{8} - 8\frac{1}{9} + 8\frac{1}{9} - 7\frac{1}{10} + 7\frac{1}{10} - 6\frac{1}{11} + 6\frac{1}{11} - 10\frac{1}{12}$$

$$-\frac{5}{84}$$

Exercise 10

Check

- 1 (a) Put commas in the correct places, then write the number in words.

4 0 7, 1 4 8, 0 0 0

four hundred seven million, one hundred forty-eight thousand

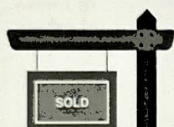
- (b) The value of the digit in the hundred millions place is 10,000 times the value of the digit in the ten thousands place.

- (c) If the digit 7 is replaced by the digit 5, the new number is 2,000,000 less than the old number.

- 2 What is the greatest odd number that is less than $7,000,000 + 30,000 + 207$?
7,030,019

- 3 A condo is sold at \$589,000 when rounded to the nearest \$1,000. What is the greatest possible price for the condo, in whole dollars?
\$589,499

- 4 (a) $\frac{240,000}{600} = 400$
(b) $900 \times 120 = 108,000$
(c) $28,800 \div 72 = 400$



- 5 Find the values. Express fractions in simplest form.

(a) $6 \times (3 + 2) - 8$

22

(b) $15 - 8 \times 3 + 2 + 6$

9

(c) $2,000 \div (100 + 300 + 15 \times 20)$ (d) $72 \times 63 + 28 \times 63$

4

6,300

(e) $4,999 \times 19$

94,981

(f) $(70 + 12) \div 12$

$6\frac{5}{6}$

(g) $8,560 \div 32$

$267\frac{1}{2}$

(h) $72 \div (7 - \frac{1}{2} - \frac{1}{3} - \frac{1}{6})$

12

(i) $6\frac{1}{4} - 3\frac{5}{8} + 2\frac{1}{3}$

$4\frac{3}{4}$

(j) $6\frac{1}{4} - (3\frac{5}{8} + 1\frac{1}{3})$

$1\frac{1}{12}$

- 6 Patrick bought 12 chairs and 3 tables for \$819. Each table cost 3 times as much as each chair. How much did 1 table cost?

1 table is same cost as 3 chairs.

3 tables is same cost as 9 chairs.

$12 \div 9 = 21$

Cost of 1 chair: $819 \div 21 = 39$

$39 \times 3 = 117$

\$117

- 7 A shopkeeper ordered 75 cans of a special brand of tea. Each can holds 50 packets of tea. Each packet costs \$2, and the can costs \$4. The shipping cost is \$25. How much did the shopkeeper pay?

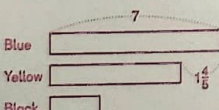
Cost of tea: $2 \times 50 \times 75 = 7,500$

Cost of cans: $4 \times 75 = 300$

$7,500 + 300 + 25 = 7,825$

\$7,825

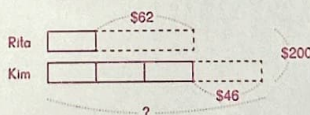
- 8 A blue cable is 7 m long. It is $1\frac{4}{5}$ m longer than a yellow cable. The yellow cable is $3\frac{3}{4}$ m longer than a black cable. How long is the black cable in meters?



$7 - 1\frac{4}{5} - 3\frac{3}{4} = 1\frac{9}{20}$

$1\frac{9}{20}$ m

- 9 At first, Rita and Kim had \$200 altogether. After Rita spent \$62 and Kim spent \$46, Kim had 3 times as much money as Rita. How much money did Kim have at first?



4 units $\rightarrow 200 - 62 - 46 = 92$

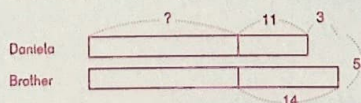
1 unit $\rightarrow 92 \div 4 = 23$

$3 \times 23 + 46 = 115$

\$115

- 10 Daniela is 11 years old. Her brother is 3 years older than she is. In how many years will their combined age be 55 years?

Her brother will always be 3 years older.



2 units $\rightarrow 55 - 25 = 30$

1 unit $\rightarrow 30 \div 2 = 15$

15 years

Challenge

- 11 Write the greatest possible whole number that will make the following true.

$$16 \times (\boxed{135} - 11) < 1,999$$

$2,000 \div 16 = 125$; $125 + 11 = 136$, so one less will give an answer less than 1,999.

- 12 Use mental calculation to find the values.

(a) $499,991 + 29,996 + 7,997 + 598 + 69$
 $500,000 + 30,000 + 8,000 + 600 + 70 - (9 + 4 + 3 + 2 + 1)$
 $= 538,651$

(b) $3,689 - (2,489 + 899)$
 $3,689 - 2,489 - 899 = 1,200 - 900 + 1 = 301$

- 13 Santino has 9 bills that total \$100. The bills are all 5-dollar bills, 10-dollar bills, or 20-dollar bills. How many of each kind of bill does he have?

Use educated guess and check or make a table. Student can, for example, start with nine 10-dollar bills only and convert some to 20-dollar bills and 5-dollar bills.

Three 20-dollar bills, two 10-dollar bills, and four 5-dollar bills.



- 14 The below expression is a way to express 26 with 5 twos, using whole numbers, fractions, and the symbols +, -, ×, ÷, and ().

$$26 = 2 \times (\frac{22}{2} + 2)$$

All the numbers from 1 to 26 can be expressed with 5 twos, except 17. Express as many numbers from 1 to 25 with 5 twos as you can. Express 17 with 6 twos.

$$1 = 2 + 2 - 2 - \frac{2}{2}$$

$$2 = 2 + 2 + 2 - 2 - 2$$

$$3 = 2 + 2 - 2 + \frac{2}{2}$$

$$4 = 2 \times 2 \times 2 - 2 - 2$$

$$5 = 2 + 2 + 2 - \frac{2}{2}$$

$$6 = 2 + 2 + 2 + 2 - 2$$

$$7 = \frac{22}{2} - 2 - 2$$

$$8 = 2 \times 2 \times 2 + 2 - 2$$

$$9 = 2 \times 2 \times 2 + \frac{2}{2}$$

$$10 = 2 + 2 + 2 + 2 + 2$$

$$11 = \frac{22}{2} + 2 - 2$$

$$12 = 2 \times 2 \times 2 + 2 + 2$$

$$13 = (22 + 2 + 2) \div 2$$

$$14 = 2 \times 2 \times 2 \times 2 - 2$$

$$15 = \frac{22}{2} + 2 + 2$$

$$16 = (2 \times 2 + 2 + 2) \times 2$$

$$17 = \frac{22}{2} + (2 \times 2) + 2$$

$$18 = 2 \times 2 \times 2 \times 2 + 2$$

$$19 = 22 - 2 - \frac{2}{2}$$

$$20 = 22 + 2 - 2 - 2$$

$$21 = 22 - 2 + \frac{2}{2}$$

$$22 = 22 \times 2 - 22$$

$$23 = 22 + 2 - \frac{2}{2}$$

$$24 = 22 - 2 + 2 + 2$$

$$25 = 22 + 2 + \frac{2}{2}$$

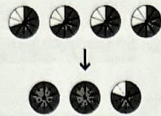
Chapter 5 Multiplication of Fractions

Exercise 1

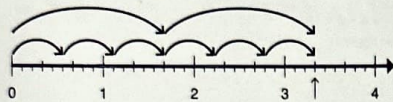
Basics

- 1 Find the value of 4 groups of $\frac{7}{10}$.

$$4 \times \frac{7}{10} = \frac{4 \times 7}{10} = \frac{28}{10} = \frac{14}{5} = 2\frac{4}{5}$$



- 2 Find the product of 6 and $\frac{5}{9}$.



$$6 \times \frac{5}{9} = \frac{6 \times 5}{9} = \frac{30}{9} = \frac{10}{3} = 3\frac{1}{3}$$

- 3 $25 \times \frac{5}{8} = \frac{125}{8} = 15\frac{5}{8}$

- 4 $16 \times \frac{1}{6} = \frac{16}{6} = \frac{8}{3} = 2\frac{2}{3}$

5.1 Multiplying a Fraction by a Whole Number

103

Practice

- 5 Multiply. Express each answer in simplest form.

(a) $15 \times \frac{2}{5} = 6$ (b) $24 \times \frac{3}{4} = 18$

(c) $13 \times \frac{3}{7} = 5\frac{4}{7}$ (d) $10 \times \frac{3}{8} = 3\frac{3}{4}$

(e) $8 \times \frac{3}{10} = 2\frac{2}{5}$ (f) $20 \times \frac{5}{6} = 16\frac{2}{3}$

(g) $8 \times \frac{7}{20} = 2\frac{4}{5}$ (h) $15 \times \frac{5}{12} = 6\frac{1}{4}$

- 6 A paper clip is $\frac{7}{8}$ in long. How long are 12 paper clips placed in a row end to end?

$$12 \times \frac{7}{8} = 10\frac{1}{2}$$

10 $\frac{1}{2}$ in

5.1 Multiplying a Fraction by a Whole Number

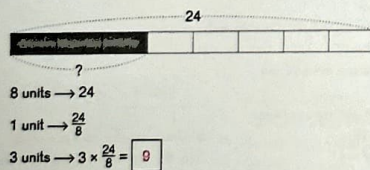
104

Exercise 2 • pages 105–106

Exercise 2

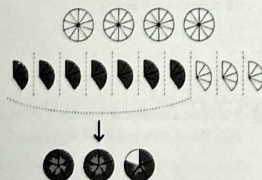
Basics

- 1 Find $\frac{3}{8}$ of 24.

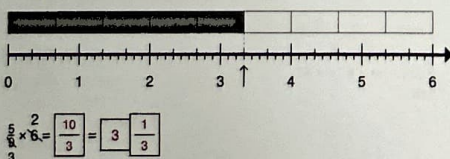


- 2 Find $\frac{7}{10}$ of 4.

$$\frac{7}{10} \times 4 = 7 \times \frac{4}{10} = \frac{28}{10} = \frac{14}{5} = 2\frac{4}{5}$$



- 3 Find $\frac{5}{9}$ of 6.



$$\frac{5}{9} \times 6 = \frac{5 \times 6}{9} = \frac{30}{9} = \frac{10}{3} = 3\frac{1}{3}$$

5.2 Multiplying a Fraction by a Whole Number

105

Practice

- 4 Multiply. Express each answer in simplest form.

(a) $\frac{1}{9} \times 180 = 20$ (b) $\frac{3}{8} \times 56 = 21$

(c) $\frac{3}{10} \times 120 = 36$ (d) $\frac{5}{9} \times 3 = 1\frac{2}{3}$

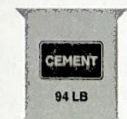
(e) $\frac{3}{4} \times 30 = 22\frac{1}{2}$ (f) $\frac{7}{8} \times 20 = 17\frac{1}{2}$

(g) $\frac{3}{7} \times 18 = 7\frac{5}{7}$ (h) $\frac{7}{10} \times 15 = 10\frac{1}{2}$

- 5 Stanley used $\frac{3}{4}$ of the cement in a 94-pound bag of cement. How many pounds of cement did he use?

$$\frac{3}{4} \times 94 = 70\frac{1}{2}$$

70 $\frac{1}{2}$ lb



5.2 Multiplying a Fraction by a Whole Number

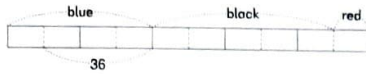
106

Exercise 3

Basics

- 1 $\frac{2}{5}$ of the pens in a box are blue, $\frac{1}{2}$ of them are black. The rest of them are red. There are 36 more blue pens than red pens. How many pens are there altogether?

$$\frac{2}{5} = \frac{4}{10} \quad \frac{1}{2} = \frac{5}{10}$$



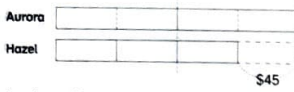
$$3 \text{ units} \rightarrow 36$$

$$1 \text{ unit} \rightarrow \frac{36}{3} = 12$$

$$10 \text{ units} \rightarrow 10 \times 12 = 120$$

120 pens

- 2 $\frac{1}{2}$ of Aurora's savings is equal to $\frac{2}{3}$ of Hazel's savings. After Hazel saved another \$45, they both had the same amount of money. How much money did Aurora save?

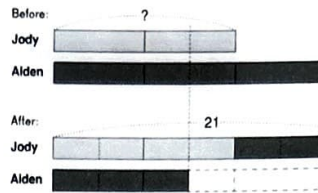


$$1 \text{ unit} \rightarrow 45$$

$$4 \text{ units} \rightarrow 4 \times 45 = 180$$

\$180

- 3 Jody had $\frac{2}{3}$ as many action figures as Aiden. After Aiden gave $\frac{1}{2}$ of his action figures to Jody, Jody had 21 action figures. How many action figures did Jody have at first?



$$7 \text{ units} \rightarrow 21$$

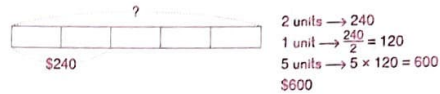
$$1 \text{ unit} \rightarrow \frac{21}{7} = 3$$

$$4 \text{ units} \rightarrow 4 \times 3 = 12$$

12 action figures

Practice

- 4 Sarah spent $\frac{2}{5}$ of her money on a keyboard. If the keyboard cost \$240, how much money did she have at first?



$$2 \text{ units} \rightarrow 240$$

$$1 \text{ unit} \rightarrow \frac{240}{2} = 120$$

$$5 \text{ units} \rightarrow 5 \times 120 = 600$$

\$600

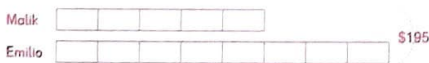
- 5 There were 10 lb of flour in a bag. Alberto used $\frac{2}{5}$ of the flour for bread and $\frac{1}{4}$ of the flour for pancakes. How many pounds of flour are left?

$$1 - \frac{2}{5} - \frac{1}{4} = \frac{7}{20}$$

$$\frac{7}{20} \times 10 = 3\frac{1}{2}$$

$3\frac{1}{2}$ lb

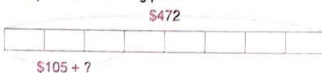
- 6 Malik has $\frac{5}{8}$ as much money as Emilio. Altogether, they have \$195. How much money does Emilio have?



$$\frac{8}{13} \times 195 = 120$$

\$120

- 7 Amalie had \$472 in savings. She spent \$105 on hiking boots and some more money on hiking poles. She has $\frac{5}{8}$ of her savings left. How much did she spend on the hiking poles?



$$\frac{5}{8} \times 472 = 177$$

$$177 - 105 = 72$$

\$72



- 8 A baker made 3 kinds of bagels. $\frac{3}{8}$ of them were plain bagels and $\frac{1}{5}$ of them were cheese bagels. The rest were sesame seed bagels. There were 28 fewer cheese bagels than plain bagels. How many sesame seed bagels were there?

$$\frac{3}{8} = \frac{15}{40} \quad \frac{1}{5} = \frac{8}{40}$$

40 units total

15 units plain bagels, 8 units cheese bagels.

$$40 - 15 - 8 = 17$$

17 units sesame seed bagels.

$$15 - 8 = 7$$

7 more units plain than cheese.

$$7 \text{ units} \rightarrow 28$$

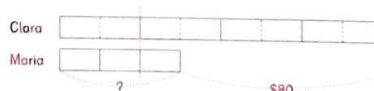
$$1 \text{ unit} \rightarrow \frac{28}{7} = 4$$

$$17 \text{ units} \rightarrow 4 \times 17 = 68$$

68 sesame seed bagels

Students may be able to realize from the common denominator that there are 40 units, and not have to draw the bar model.

- 9 $\frac{1}{4}$ of Clara's savings is equal to $\frac{2}{5}$ of Maria's savings. Clara saved \$80 more than Maria. How much did Maria save?



$$5 \text{ units} \rightarrow 80$$

$$1 \text{ unit} \rightarrow \frac{80}{5} = 16$$

$$3 \text{ units} \rightarrow 3 \times 16 = 48$$

\$48

Exercise 4

Check

- 1 Find the values. Express each answer in simplest form.

(a) $35 \times \frac{2}{5}$ 21 (b) $\frac{2}{8} \times 120$ 45

(c) $\frac{2}{3} \times 16$ $10\frac{2}{3}$ (d) $8 \times \frac{7}{12}$ $4\frac{2}{3}$

(e) $36 \times \frac{3}{8}$ $13\frac{1}{2}$ (f) $\frac{5}{9} \times 33$ $18\frac{1}{3}$

(g) $8\frac{1}{3} + 7 \times \frac{1}{6}$ $9\frac{1}{2}$ (h) $(1\frac{1}{2} - \frac{3}{4}) \times 2$ $1\frac{1}{2}$

(i) $8 \times \frac{1}{5} - 6 \times \frac{1}{5}$ $\frac{2}{5}$ (j) $\frac{4}{5} \times 6 + \frac{1}{2} \times 3$ $6\frac{3}{10}$

S-4 Practice A

111

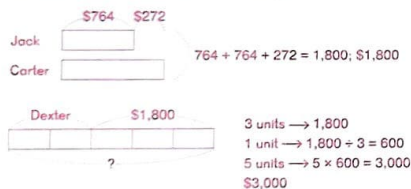
- 2 Jacob charged \$35 a day for pet sitting. In June, he had 3 clients. He worked for the first client for $\frac{1}{5}$ of the days in the month, and for the other two clients for $\frac{3}{10}$ of the days of the month. He saved $\frac{1}{3}$ of the money he made, and spent the rest. How much money did he spend? (June has 30 days.)
- $\frac{1}{5} \times 30 + 2 \times (\frac{3}{10} \times 30) = 24$
 $35 \times 24 = 840$
 $\frac{2}{3} \times 840 = 560$
 \$560

- 3 There are 240 seats in a small drama theatre. $\frac{1}{4}$ of the seats are premium seats that cost \$75. The rest are regular seats that cost \$60. For one show, tickets were sold for $\frac{2}{3}$ of the premium seats and $\frac{2}{5}$ of the regular seats. How much money was received from ticket sales?
- $\frac{1}{4} \times 240 = 60$, 60 premium seats
 $240 - 60 = 180$, 180 regular seats
 $75 \times \frac{2}{3} \times 60 = 3,000$
 $60 \times \frac{2}{5} \times 180 = 8,640$
 $3,000 + 8,640 = 11,640$
 \$11,640

112

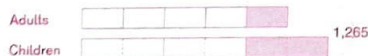
S-4 Practice A

- 4 Three friends participated in a fund-raising project. Dexter collected $\frac{2}{5}$ of the total amount. Carter collected \$272 more than Jack. Jack collected \$764. How much did the three of them collect altogether?



- 5 There were 1,265 people at a boat show. After $\frac{1}{5}$ of the adults and $\frac{1}{3}$ of the children left, there was an equal number of children and adults at the show. How many people left the show?

$\frac{4}{5}$ of the adults and $\frac{2}{3}$ of the children are still at the show, and their numbers are equal.



11 units \rightarrow 1,265
 1 unit \rightarrow $1,265 \div 11 = 115$
 3 units \rightarrow $3 \times 115 = 345$
 345 people

S-4 Practice A

113

Challenge

- 6 $297 \times \frac{26}{74}$ is closest to which of the following numbers?

50 75 100 150 200

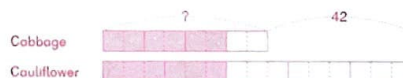
Use estimation: $297 \times \frac{26}{74} \approx 300 \times \frac{25}{75} = 300 \times \frac{1}{3} = 100$

- 7 Kai has some new kittens. When he was asked how many he had, he said the number of kittens he had was equal to three fourths of the total number plus three fourths of a kitten. How many kittens does he have?
- $\frac{3}{4}$ of a kitten is $\frac{1}{4}$ of all of his kittens.



3 kittens

- 8 After Josie sold $\frac{1}{4}$ of the cabbages and $\frac{3}{5}$ of the cauliflowers at the market, she had the same number of cabbages as cauliflowers left. If she sold 42 more cauliflowers than cabbages, how many cabbages did she have at first? She has the same number of each left, so $\frac{3}{5}$ of the cabbages is equal to $\frac{2}{5}$ of the cauliflowers. 3 units of cabbage = 2 units of cauliflower. Make equal units. A common multiple of 3 and 2 is 6.



7 units \rightarrow 42
 1 unit \rightarrow $\frac{42}{7} = 6$
 8 units \rightarrow $8 \times 6 = 48$
 48 cabbages



114

S-4 Practice A

Exercise 5

Basics

- 1 Shade the rectangle to show $\frac{1}{2}$ of $\frac{3}{5}$.



$$\frac{1}{2} \times \frac{3}{5} = \frac{1 \times 3}{2 \times 5} = \frac{3}{10}$$

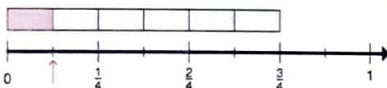
Students may shade using 2 colors overlapping, or draw diagonal lines in different directions.

- 2 Shade the rectangle to show $\frac{1}{6}$ of $\frac{2}{3}$.



$$\frac{1}{6} \times \frac{2}{3} = \frac{1 \times 2}{6 \times 3} = \frac{2}{18} = \frac{1}{9}$$

- 3 Shade the bar and draw an arrow on the number line to show $\frac{1}{6}$ of $\frac{3}{4}$.



$$\frac{1}{6} \times \frac{3}{4} = \frac{1 \times 3}{6 \times 4} = \frac{3}{24} = \frac{1}{8}$$

5-5 Multiplying a Fraction by a Unit Fraction

115

Practice

- 4 Find the values. Express each answer in simplest form.

(a) $\frac{1}{4} \times \frac{1}{6} = \frac{1}{24}$

(b) $\frac{1}{3} \times \frac{3}{5} = \frac{1}{5}$

(c) $\frac{1}{3} \times \frac{5}{6} = \frac{5}{18}$

(d) $\frac{1}{2} \times \frac{6}{7} = \frac{3}{7}$

(e) $\frac{1}{6} \times \frac{3}{10} = \frac{1}{20}$

(f) $\frac{1}{12} \times \frac{3}{4} = \frac{1}{16}$

(g) $\frac{1}{6} \times \frac{6}{7} = \frac{1}{7}$

(h) $\frac{1}{9} \times \frac{72}{100} = \frac{2}{25}$

- 5 John has a garden with an area of $\frac{4}{5}$ acres. He planted herbs in $\frac{1}{8}$ of the garden. How many acres did he plant with herbs?

$$\frac{1}{8} \times \frac{4}{5} = \frac{1}{10}$$

$\frac{1}{10}$ acres



116

5-5 Multiplying a Fraction by a Unit Fraction

Exercise 6

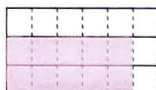
Basics

- 1 Shade the rectangle to show $\frac{2}{3}$ of $\frac{4}{5}$.



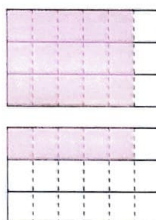
$$\frac{2}{5} \times \frac{4}{3} = \frac{2 \times 4}{5 \times 3} = \frac{8}{15}$$

- 2 Shade the rectangle to show $\frac{5}{6}$ of $\frac{2}{3}$.



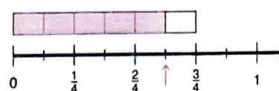
$$\frac{5}{6} \times \frac{2}{3} = \frac{5 \times 2}{6 \times 3} = \frac{10}{18} = \frac{5}{9}$$

- 3 Shade the rectangles to show $\frac{5}{6}$ of $\frac{4}{3}$.



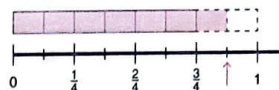
$$\frac{5}{6} \times \frac{4}{3} = \frac{5 \times 4}{6 \times 3} = \frac{20}{18} = 1 \frac{1}{9}$$

- 4 Shade the bar and draw an arrow on the number line to show $\frac{5}{6}$ of $\frac{3}{4}$.



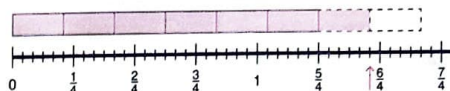
$$\frac{5}{6} \times \frac{3}{4} = \frac{5 \times 3}{6 \times 4} = \frac{15}{24} = \frac{5}{8}$$

- 5 Shade the bar and draw an arrow on the number line to show $\frac{7}{6}$ of $\frac{3}{4}$.



$$\frac{7}{6} \times \frac{3}{4} = \frac{7 \times 3}{6 \times 4} = \frac{21}{24} = \frac{7}{8}$$

- 6 Shade the bar and draw an arrow on the number line to show $\frac{7}{6}$ of $\frac{5}{4}$.



$$\frac{7}{6} \times \frac{5}{4} = \frac{7 \times 5}{6 \times 4} = \frac{35}{24} = 1 \frac{11}{24}$$

Practice

- 7 Which of the following will have values greater than $\frac{2}{3}$?

$$\frac{2}{3} \times \frac{1}{3}$$

$$\frac{2}{3} \times \frac{2}{3}$$

$$\frac{2}{3} \times \frac{1}{2}$$

$$\frac{2}{3} \times \frac{3}{2}$$

$$\frac{32}{17} \times \frac{2}{3}$$

- 8 Find the values. Express each answer in simplest form.

(a) $\frac{3}{4} \times \frac{7}{10} = \frac{21}{40}$

(b) $\frac{2}{3} \times \frac{4}{7} = \frac{8}{21}$

(c) $\frac{2}{3} \times \frac{5}{6} = \frac{5}{9}$

(d) $\frac{3}{4} \times \frac{8}{11} = \frac{6}{11}$

(e) $\frac{7}{4} \times \frac{7}{20} = \frac{49}{80}$

(f) $\frac{5}{6} \times \frac{3}{2} = 1 \frac{1}{4}$

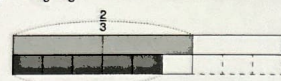
(g) $\frac{3}{2} \times \frac{7}{5} = 2 \frac{1}{10}$

(h) $\frac{5}{4} \times \frac{8}{5} = 2$

Exercise 7

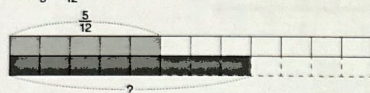
Basics

- 1 Find $\frac{5}{6}$ of $\frac{2}{3}$.



$$\frac{5}{6} \times \frac{2}{3} = \frac{5 \times 2}{6 \times 3} = \frac{10}{18} = \frac{5}{9}$$

- 2 Find $\frac{8}{9}$ of $\frac{5}{12}$.



$$\frac{8}{9} \times \frac{5}{12} = \frac{8 \times 5}{9 \times 12} = \frac{40}{108} = \frac{10}{27}$$

- 3 Find the product of $\frac{5}{9}$ and $\frac{6}{7}$.

$$\frac{5}{9} \times \frac{6}{7} = \frac{10}{21}$$

- 4 Find the product of $\frac{12}{5}$ and $\frac{15}{8}$.

$$\frac{12}{5} \times \frac{15}{8} = \frac{9}{2} \times \frac{15}{4} = \frac{135}{8} = 16 \frac{7}{8}$$

Practice

- 5 Find the values. Express each answer in simplest form.

(a) $\frac{4}{5} \times \frac{3}{14} = \frac{12}{70} = \frac{6}{35}$

(b) $\frac{2}{3} \times \frac{4}{5} = \frac{8}{15}$

(c) $\frac{5}{9} \times \frac{3}{10} = \frac{15}{90} = \frac{1}{6}$

(d) $\frac{3}{8} \times \frac{4}{15} = \frac{12}{120} = \frac{1}{10}$

(e) $\frac{5}{6} \times \frac{8}{15} = \frac{40}{90} = \frac{4}{9}$

(f) $\frac{8}{9} \times \frac{9}{20} = \frac{72}{180} = \frac{2}{5}$

(g) $\frac{5}{3} \times \frac{12}{5} = 4$

(h) $\frac{105}{104} \times \frac{16}{7} = 2 \frac{4}{13}$

- 6 A bag of rice weighs $\frac{9}{10}$ kg. Amy used $\frac{2}{3}$ of it to make rice pudding. How many kilograms of rice did she use?

$$\frac{2}{3} \times \frac{9}{10} = \frac{18}{30} = \frac{3}{5}$$

$\frac{3}{5}$ kg

Challenge

- 7 $\frac{1}{3}$ and $\frac{1}{4}$ have the same product and difference:

$$\frac{1}{3} \times \frac{1}{4} = \frac{1}{3} - \frac{1}{4}$$

Name five other pairs of numbers that have the same product and difference.

Possible answers: $\frac{1}{2}$ and $\frac{1}{3}$, $\frac{1}{4}$ and $\frac{1}{5}$, $\frac{1}{5}$ and $\frac{1}{6}$, $\frac{1}{6}$ and $\frac{1}{7}$, $\frac{1}{7}$ and $\frac{1}{8}$, $\frac{1}{8}$ and $\frac{1}{9}$, $\frac{1}{9}$ and $\frac{1}{10}$

Any pair of unit fractions where one denominator is 1 more than the other denominator is a solution.

- 8 Fill in the blanks to make each equation true. All fractions must be less than 1 and in simplest form.

(a) $\frac{3}{10} \times \frac{5}{7} = \frac{3}{14}$

(b) $\frac{5}{12} \times \frac{4}{15} = \frac{1}{9}$

(c) $\frac{5}{21} \times \frac{7}{10} = \frac{1}{6}$

(d) $\frac{8}{15} \times \frac{9}{10} = \frac{12}{25}$

Exercise 8

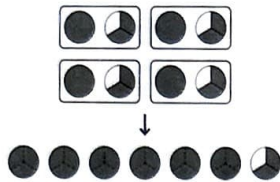
Basics

- 1 Find 4 groups of $1\frac{2}{3}$.

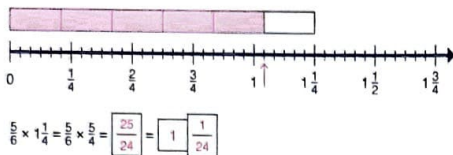
$$4 \times 1\frac{2}{3} = 4 \times \frac{5}{3}$$

$$= \frac{20}{3}$$

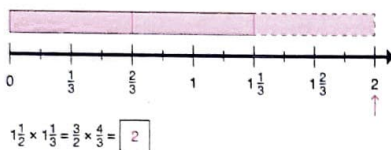
$$= 6\frac{2}{3}$$



- 2 Shade the bar and draw an arrow on the number line to show $\frac{5}{6}$ of $1\frac{1}{4}$.



- 3 Shade the bar and draw an arrow on the number line to show $1\frac{1}{2}$ times as much as $1\frac{1}{3}$.



Practice

- 4 Find the values. Express each answer in simplest form.

(a) $3\frac{2}{5} \times 25 = 85$ (b) $14 \times 2\frac{4}{5} = 39\frac{1}{5}$

(c) $15 \times 2\frac{4}{9} = 36\frac{2}{3}$ (d) $\frac{4}{5} \times 3\frac{1}{8} = 2\frac{1}{2}$

(e) $1\frac{5}{6} \times \frac{5}{8} = 1\frac{7}{48}$ (f) $1\frac{1}{8} \times 3\frac{5}{9} = 4$

(g) $2\frac{1}{7} \times 4\frac{1}{5} = 9$ (h) $1\frac{7}{9} \times 2\frac{1}{10} = 3\frac{11}{15}$

- 5 Josh picked $4\frac{3}{4}$ pounds of strawberries. Mandy picked $1\frac{1}{3}$ times as many pounds of strawberries as Josh did. How many pounds of strawberries did they pick altogether?

$$1\frac{1}{3} \times 4\frac{3}{4} = \frac{4}{3} \times \frac{19}{4} = \frac{19}{3} = 6\frac{1}{3}$$

$$4\frac{3}{4} + 6\frac{1}{3} = 11\frac{1}{2}$$

$$11\frac{1}{2} \text{ lb}$$



- 6 25 seeds are planted. The distance between each seed is $1\frac{3}{4}$ inches. What is the distance between the first and last seed in inches?

There are 24 intervals between the first and last seed.

$$24 \times 1\frac{3}{4} = 42$$

42 inches

Challenge

- 7 Write the digits 1, 2, or 3 in each blank space to make each equation true. All fractions must be in simplest form.

(a) $\boxed{3} \frac{1}{2} \times \frac{2}{3} = \boxed{2} \frac{1}{3}$

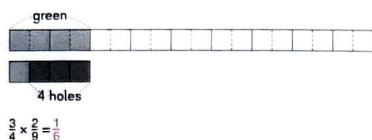
(b) $\boxed{1} \frac{2}{3} \times 1\frac{2}{5} = \boxed{2} \frac{1}{3}$

Exercise 9

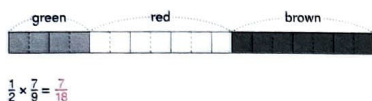
Basics

- 1 $\frac{2}{5}$ of the buttons in a bag are green.

- (a) $\frac{1}{4}$ of the green buttons have two holes and the rest have 4 holes. What fraction of the buttons are green and have 4 holes?



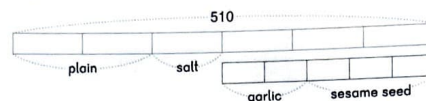
- (b) $\frac{1}{2}$ of the remaining buttons are red. The rest of the buttons are brown. What fraction of the total number of buttons are brown?



- (c) There are 14 brown buttons. How many buttons are there altogether?

7 units \rightarrow 14
 1 unit $\rightarrow 14 \div 7 = 2$
 18 units $\rightarrow 18 \times 2 = 36$
 36 buttons

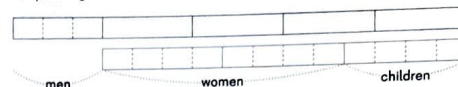
- 2 A bakery has 510 bagels. $\frac{1}{3}$ of the bagels are plain, $\frac{1}{6}$ of them are salt, $\frac{2}{5}$ of the remainder are garlic, and the rest are sesame seed. How many of the bagels are sesame seed?



Remainder (garlic and sesame seed): $1 - (\frac{1}{3} + \frac{1}{6}) = \frac{1}{2}$

Sesame seed: $\frac{2}{5} \times \frac{1}{2} \times 510 = 153$

- 3 $\frac{1}{5}$ of the passengers on a ship are men. $\frac{2}{3}$ of the remainder are women, and the rest are children. There are 234 more children than men. How many of the passengers are women?



Women: $\frac{2}{3} \times \frac{4}{5} = \frac{8}{15}$

Children: $\frac{1}{3} \times \frac{4}{5} = \frac{4}{15}$

$\frac{4}{15} - \frac{1}{5} = \frac{1}{15}$

$\frac{1}{15}$ of the total \rightarrow 234

$\frac{8}{15}$ of the total $\rightarrow 8 \times 234 = 1,872$

1,872 passengers

Practice

- 4 Patrick spent $\frac{5}{6}$ of his money on camping equipment. $\frac{2}{3}$ of what he spent was for a backpack and the rest was for a tent. He had \$60 left. How much did the tent cost?



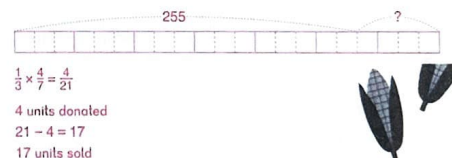
1 unit \rightarrow 60
 3 units $\rightarrow 3 \times 60 = 180$
 \$180

- 5 Rosa spent $\frac{1}{4}$ of her money on a camping stove and $\frac{1}{8}$ of the remainder on a water purifier. She spent \$267. How much money did she have at first?



$\frac{1}{4} \times \frac{3}{4} = \frac{3}{16}$
 stove + purifier = 3 out of 8 units
 3 units \rightarrow 267
 1 unit $\rightarrow 267 \div 3 = 89$
 8 units $\rightarrow 8 \times 89 = 712$
 \$712

- 6 Josie sold $\frac{3}{7}$ of all the ears of corn she brought to the market in the morning and $\frac{2}{3}$ of the remaining ears of corn in the afternoon. She sold 255 ears of corn in all. She donated the leftover ears of corn to the food bank. How many ears of corn did she donate to the food bank?



$\frac{1}{3} \times \frac{4}{7} = \frac{4}{21}$

4 units donated

$21 - 4 = 17$

17 units sold

17 units \rightarrow 255

1 unit $\rightarrow 255 \div 17 = 15$

4 units $\rightarrow 4 \times 15 = 60$

60 ears of corn

Challenge

- 7 Luisa had $5\frac{1}{2}$ kg of beans. On Monday, she used $\frac{1}{5}$ of the beans to make refried beans. On Tuesday, she used $\frac{1}{3}$ of the remaining beans to make enchiladas. On Wednesday, she used $\frac{2}{5}$ of the rest of the beans to make soup. How many kilograms of beans does she have left?

After Monday, $\frac{4}{5}$ of the total remain. After Tuesday, $\frac{2}{3}$ of $\frac{4}{5}$ of the total remain. After Wednesday, $\frac{3}{5}$ of $\frac{2}{3}$ of $\frac{4}{5}$ of the total remains.

$\frac{3}{5} \times \frac{2}{3} \times \frac{4}{5} \times 5\frac{1}{2} = 1\frac{1}{10}$

$1\frac{1}{10}$ kg

Exercise 10 • pages 130–131

Exercise 10

Basics

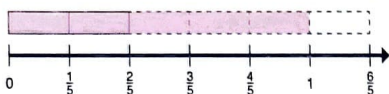
- 1 Find the value of 3 groups of $\frac{1}{3}$.



$$3 \times \frac{1}{3} = 1$$

$$3 \times \frac{1}{3} = 1, \text{ so the reciprocal of 3 is } \frac{1}{3}.$$

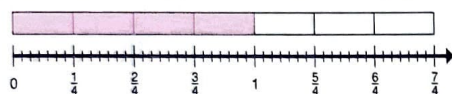
- 2 Shade the bar and draw an arrow on the number line to show $\frac{5}{2}$ of $\frac{2}{5}$.



$$\frac{5}{2} \times \frac{2}{5} = 1$$

The reciprocal of $\frac{5}{2}$ is $\frac{2}{5}$.

- 3 Shade the bar and draw an arrow on the number line to show $\frac{4}{7}$ of $\frac{7}{4}$.



$$\frac{4}{7} \times \frac{7}{4} = 1$$

The reciprocal of $\frac{4}{7}$ is $\frac{7}{4}$.

130

5-10 Fractions and Reciprocals

- 4 Find the reciprocal of $4\frac{1}{3}$.

$$4\frac{1}{3} = \frac{13}{3}$$

$$\text{The reciprocal of } 4\frac{1}{3} \text{ is } \frac{3}{13}.$$

Practice

- 5 Write the reciprocal of each number. Express fractions greater than 1 as improper fractions.

(a) $\frac{1}{8}$ 8

(b) $\frac{7}{12}$ $\frac{12}{7}$

(c) $\frac{10}{3}$ $\frac{3}{10}$

(d) $2\frac{1}{9}$ $\frac{9}{19}$

(e) 10 $\frac{1}{10}$

(f) $2\frac{5}{8}$ $\frac{8}{21}$

- 6 Fill in the blanks. Express answers in simplest form.

(a) $12 \times \frac{1}{12} = 1$

(b) $1\frac{2}{5} \times \frac{5}{2} = 1$

(c) $1\frac{3}{7} \times \frac{7}{10} = 1$

(d) $\frac{3}{7} \times 2\frac{1}{3} = 1$

(e) $\frac{1}{3} \times \frac{3}{5} \times 5 = 1$

(f) $1\frac{1}{4} \times \frac{3}{5} \times \frac{1}{3} = 1$

5-10 Fractions and Reciprocals

131

Exercise 11 • pages 132–136

Exercise 11

Check

- 1 Find the values. Express each answer in simplest form.

(a) $\frac{4}{6} \times \frac{1}{2} = \frac{2}{6}$

(b) $\frac{2}{5} \times \frac{7}{8} = \frac{7}{20}$

(c) $\frac{5}{6} \times \frac{6}{5} = 1$

(d) $3 \times 3\frac{5}{9} = 10\frac{2}{3}$

(e) $1\frac{1}{6} \times 9\frac{6}{7} = 11\frac{1}{2}$

(f) $\frac{4}{5} \times \frac{3}{8} \times 20 = 6$

(g) $\frac{2}{3} + \frac{2}{5} \times \frac{1}{4} = \frac{23}{30}$

(h) $\frac{5}{6} \times 18 + 4 \times \frac{1}{3} = 1\frac{1}{2}$

(i) $\frac{2}{3} \times \frac{2}{5} + \frac{1}{3} + 28 \div 6 = 5\frac{4}{15}$

(j) $15 - (14 \times \frac{5}{2}) + \frac{3}{8} \times \frac{5}{15} = 3\frac{5}{6}$

132

5-11 Practice B

- 2 Write the reciprocal of each value. Express fractions greater than 1 as improper fractions.

(a) $\frac{5}{8}$ $\frac{8}{5}$

(b) $\frac{7}{5}$ $\frac{5}{7}$

(c) $2\frac{2}{11}$ $\frac{11}{24}$

(d) $5 + 3\frac{1}{8}$

(e) $\frac{1}{5} \times \frac{1}{3} = 15$

(f) $\frac{1}{5} + \frac{1}{3} = \frac{15}{8}$

- 3 What is the sum of the reciprocals of $\frac{3}{5}$ and $\frac{2}{3}$?

$$\frac{5}{3} + \frac{3}{2} = 3\frac{1}{6}$$

- 4 Three identical bags of sand weigh 10 kg altogether. How many kilograms do 8 of these bags weigh?

$$8 \times \frac{10}{3} = \frac{80}{3} = 26\frac{2}{3}$$

26 $\frac{2}{3}$ kg

- 5 How many $\frac{3}{4}$ -cup scoops of flour will make 1 cup of flour?

$$1\frac{1}{3} \text{ scoops}$$

5-11 Practice B

133

Methods may vary.

- 6 On Saturday, Tomas read $\frac{1}{3}$ of his book. On Sunday, he read $\frac{2}{5}$ of what was left. What fraction of his book does he still have to read?

The remainder after Saturday is $\frac{2}{3}$. After Sunday it is $\frac{2}{5}$ of that.

$$\frac{2}{3} \times \frac{2}{5} = \frac{4}{15}$$

$\frac{4}{15}$ of his book

- 7 Tania had $3\frac{3}{5}$ L of juice. She drank $\frac{1}{3}$ of it on Monday, and $\frac{2}{5}$ of the remainder on Tuesday. How many liters of juice does she have left?

Remainder from Monday: $\frac{2}{5} \times 3\frac{3}{5} = \frac{2}{5} \times \frac{18}{5} = \frac{36}{25}$

Remainder from Tuesday: $\frac{1}{3} \times \frac{36}{25} = \frac{12}{25}$

$\frac{4}{5}$ L

- 8 In Amy's class, $\frac{2}{5}$ of the students have pets. $\frac{3}{4}$ of the students who have pets have dogs. If 15 students have dogs, how many students are in her class?



3 units \rightarrow 15
6 units $\rightarrow 2 \times 15 = 30$
30 students



- 9 A square has sides $5\frac{1}{3}$ cm long. The rectangle below is made up of $3\frac{1}{2}$ of these squares. What is the perimeter of the figure?

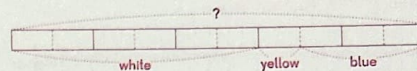


One side is 1 unit. The perimeter is 9 units total.

Perimeter: $9 \times 5\frac{1}{3} = 48$

48 cm

- 10 Rohan bought some tiles for a kitchen floor. $\frac{3}{5}$ of the tiles were white, $\frac{1}{4}$ of the remainder were yellow, and the rest were blue. There were 60 more white tiles than blue tiles. Each tile cost \$3. What was the total cost of the tiles?



$$\frac{1}{4} \times \frac{2}{5} = \frac{1}{10}$$

Divide the whole bar into 10 units.

Divide each fifth in half.

There are 6 units of white and 3 units of blue.

3 units \rightarrow 60

1 unit $\rightarrow 60 \div 3 = 20$

10 units $\rightarrow 10 \times 20 = 200$

$3 \times 200 = 600$

\$600

Challenge

- 11 A tank is $\frac{7}{8}$ full. If another 3 L of water is added, it will be $\frac{7}{8}$ full. What is the capacity of the tank?



$$\frac{7}{8} - \frac{3}{8} = \frac{4}{8}$$

$$\frac{4}{8} \rightarrow 3 \text{ L}$$

$$\frac{24}{24} \rightarrow 24 \times \frac{3}{8} = 9 \text{ L}$$

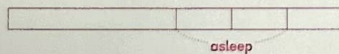
$$14\frac{2}{5} \text{ L}$$

$$5 \text{ units} \rightarrow 3$$

$$1 \text{ unit} \rightarrow \frac{3}{5}$$

$$24 \text{ units} \rightarrow 24 \times \frac{3}{5} = 14\frac{2}{5}$$

- 12 A passenger fell asleep on a train halfway to his destination. He slept until he had half as far to go as the distance he traveled while he was asleep. What fraction of the trip was he sleeping?



$$\frac{2}{3} \times \frac{1}{2} = \frac{1}{3}$$

$\frac{1}{3}$ of his trip

- 13 A boy has as many sisters as brothers, but each sister has only half as many sisters as brothers. How many brothers and sisters are in the family?

4 brothers and 3 sisters. Students can use guess and check or logical thinking.

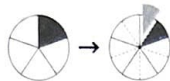
Chapter 6 Division of Fractions

Exercise 1

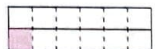
Basics

- 1 Divide $\frac{1}{5}$ by 2.

$$\begin{aligned}\frac{1}{5} \div 2 &= \frac{1}{2} \text{ of } \frac{1}{5} \\ &= \frac{1}{2} \times \frac{1}{5} \\ &= \frac{1}{10}\end{aligned}$$



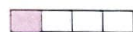
- 2 Shade the rectangle to show $\frac{1}{2} \div 6$.



Students may instead shade using 2 colors overlapping, or draw diagonal lines in different directions.

$$\begin{aligned}\frac{1}{2} \div 6 &= \frac{1}{2} \times \frac{1}{6} \\ &= \frac{1}{12}\end{aligned}$$

- 3 Shade the bar and draw an arrow on the number line to show $\frac{1}{3} \div 4$.



$$\frac{1}{3} \div 4 = \frac{1}{3} \times \frac{1}{4} = \frac{1}{12}$$

6-1 Dividing a Unit Fraction by a Whole Number

137

Practice

- 4 Divide.

(a) $\frac{1}{5} \div 5 = \frac{1}{25}$

(b) $\frac{1}{8} \div 2 = \frac{1}{16}$

(c) $\frac{1}{10} \div 10 = \frac{1}{100}$

(d) $\frac{1}{15} \div 4 = \frac{1}{60}$

5 (a) $\frac{1}{7} \div \frac{6}{42} = \frac{1}{42}$

(b) $\frac{1}{3} \div \frac{6}{18} = \frac{1}{18}$

(c) $\frac{1}{2} \div 25 = \frac{1}{50}$

(d) $\frac{1}{20} \div 5 = \frac{1}{100}$

- 6 4 sheets of plywood are $\frac{1}{2}$ in thick. How thick is 1 sheet of plywood?

$$\frac{1}{2} \div 4 = \frac{1}{8}$$

$\frac{1}{8}$ inch

- 7 5 racquetballs weigh $\frac{1}{4}$ kg. How many kilograms does 1 racquetball weigh?

$$\frac{1}{4} \div 5 = \frac{1}{20}$$

$\frac{1}{20}$ kg



138

6-1 Dividing a Unit Fraction by a Whole Number

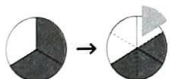
Exercise 2 • pages 139–140

Exercise 2

Basics

- 1 Divide $\frac{2}{3}$ by 4.

$$\begin{aligned}\frac{2}{3} \div 4 &= \frac{1}{4} \text{ of } \frac{2}{3} \\ &= \frac{1}{4} \times \frac{2}{3} \\ &= \frac{1}{6}\end{aligned}$$

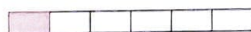


- 2 Shade the rectangle to show $\frac{3}{4} \div 5$.



$$\begin{aligned}\frac{3}{4} \div 5 &= \frac{3}{4} \times \frac{1}{5} \\ &= \frac{3}{20}\end{aligned}$$

- 3 Shade the bar and draw an arrow on the number line to show $\frac{2}{3} \div 6$.



$$\frac{2}{3} \div 6 = \frac{2}{3} \times \frac{1}{6} = \frac{1}{9}$$

6-2 Dividing a Fraction by a Whole Number

139

Practice

- 4 Divide. Express each answer in simplest form.

(a) $\frac{3}{10} \div 2 = \frac{3}{20}$

(b) $\frac{5}{6} \div 3 = \frac{5}{18}$

(c) $\frac{5}{8} \div 10 = \frac{1}{16}$

(d) $\frac{6}{7} \div 9 = \frac{2}{21}$

(e) $\frac{8}{9} \div 12 = \frac{2}{27}$

(f) $\frac{3}{5} \div 12 = \frac{1}{20}$

- 5 A regular hexagon has 6 equal sides. Its perimeter is $\frac{3}{5}$ m. How long is one side in meters?

$$\frac{3}{5} \div 6 = \frac{1}{10}$$

$\frac{1}{10}$ m

- 6 Joseph bought $\frac{9}{10}$ kg of grapes. He bought 3 times as many kilograms of grapes as Paula bought. How many kilograms of grapes did Paula buy?

$$\frac{9}{10} \div 3 = \frac{3}{10}$$

$\frac{3}{10}$ kg

Challenge

7 (a) $\frac{5}{7} \div 25 = \frac{1}{35}$

(b) $\frac{9}{10} \div 6 = \frac{3}{20}$

140

6-2 Dividing a Fraction by a Whole Number

Exercise 3

Check

- 1 Find the values. Express each answer in simplest form.

(a) $\frac{1}{6} \div 5$ $\frac{1}{30}$ (b) $\frac{8}{9} \div 4$ $\frac{2}{9}$

(c) $\frac{3}{4} \div 6$ $\frac{1}{8}$ (d) $\frac{6}{7} \div 10$ $\frac{3}{35}$

(e) $\frac{3}{5} \div 10 \times \frac{6}{7}$ $\frac{2}{35}$ (f) $(2\frac{1}{7} \times 2\frac{1}{3}) \div 5$ 1

(g) $(\frac{4}{5} - \frac{1}{2}) \div 3 \times 20$ 2 (h) $(2\frac{1}{3} - \frac{5}{6} - \frac{1}{2}) \div 6 \times \frac{2}{5}$ $\frac{1}{10}$

- 2 Violet used $\frac{3}{4}$ of a bag of dirt to fill 6 pots. What fraction of the bag of dirt is in each pot?

$\frac{3}{4} \div 6 = \frac{1}{8}$
 $\frac{1}{8}$ of the bag

6-3 Practice A

141

- 3 8 identical blocks weigh $\frac{2}{5}$ kg. How many kilograms does 1 block weigh?

$\frac{2}{5} \div 8 = \frac{1}{20}$
 $\frac{1}{20}$ kg

- 4 Isaiah spent $\frac{1}{3}$ of his money on a notebook and the remainder on 4 identical pencils. What fraction of his money did he spend on 1 pencil?

The remainder is $\frac{2}{3}$ of his money.
 $\frac{2}{3} \div 4 = \frac{1}{6}$
 $\frac{1}{6}$ of his money

Challenge

5 (a) $\frac{2}{7} \div \boxed{4} = \frac{1}{14}$

(b) $\frac{8}{15} \div \boxed{12} = \frac{2}{45}$

- 6 Find the values. Express each answer in simplest form.

(a) $7\frac{1}{2} \div 2$ $\frac{15}{2} \times \frac{1}{2} = 3\frac{3}{4}$

(b) $5\frac{2}{5} \div 8$ $\frac{28}{5} \times \frac{1}{8} = \frac{7}{10}$

(c) $(5 - 1\frac{1}{2}) \div 4$ $\frac{24}{7} \times \frac{1}{4} = \frac{6}{7}$

(d) $5 - 3\frac{2}{5} \div 3$ $5 - \frac{18}{5} \times \frac{1}{3} = 5 - \frac{6}{5} = 3\frac{4}{5}$

142

6-3 Practice A

Exercise 4

Basics

- 1 (a) $\frac{5}{1}$ is the reciprocal of $\frac{1}{5}$.

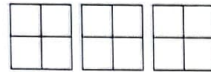
- (b) How many fifths are in 2 wholes?

$$2 \div \frac{1}{5} = 2 \times \boxed{5} \\ = \boxed{10}$$



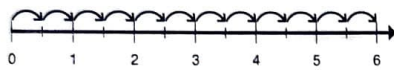
- 2 (a) $\frac{4}{1}$ is the reciprocal of $\frac{1}{4}$.

- (b) How many fourths are in 3 wholes?



$$3 \div \frac{1}{4} = 3 \times \boxed{4} \\ = \boxed{12}$$

- 3 How many halves are in 6?



$$6 \div \frac{1}{2} = 6 \times \boxed{2} \\ = \boxed{12}$$

6-4 Dividing a Whole Number by a Unit Fraction

143

- 4 Finish labeling the tick marks on the number lines to find the answers.

- (a) $\frac{1}{2}$ of what is 6?



$$\frac{1}{2} \times ? = 6$$

$$6 \div \frac{1}{2} = 6 \times \boxed{2} = \boxed{12}$$

- (b) 3 is $\frac{1}{3}$ of what number?



$$3 \div \frac{1}{3} = 3 \times \boxed{3} = \boxed{9}$$

Practice

- 5 Divide.

(a) $4 \div \frac{1}{5} = 20$

(b) $1 \div \frac{1}{10} = 10$

(c) $3 \div \frac{1}{12} = 36$

(d) $50 \div \frac{1}{2} = 100$

144

6-4 Dividing a Whole Number by a Unit Fraction

6 (a) $3 \div \frac{1}{2} = 6$

(b) $7 \div \frac{1}{4} = 28$

(c) $\boxed{10} \div \frac{1}{4} = 40$

(d) $\boxed{9} \div \frac{1}{6} = 54$

- 7 Each of the sides of a polygon is $\frac{1}{5}$ m long. The perimeter of the polygon is 2 m. How many sides does the polygon have?

$$2 \div \frac{1}{5} = 10$$

10 sides

- 8 $\frac{1}{12}$ of a length of rope is 5 ft. How long is the rope in feet?

$$5 \div \frac{1}{12} = 5 \times 12 = 60$$

60 feet

6-4 Dividing a Whole Number by a Unit Fraction

145

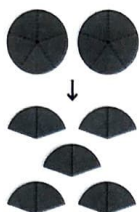
Exercise 5

Basics

- 1 How many $\frac{2}{5}$ s are in 2 wholes?

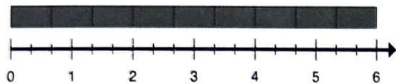
$$2 \div \frac{2}{5} = 2 \times 5$$

$$2 \div \frac{2}{5} = \frac{2 \times 5}{2} = 2 \times \frac{5}{2} = 5$$



- 2 (a) $\frac{3}{5}$ is the reciprocal of $\frac{5}{3}$.

- (b) How many $\frac{2}{5}$ s are in 6?



$$6 \div \frac{2}{5} = 6 \times \frac{5}{2} = 15$$

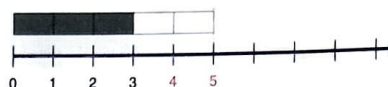
- (c) How many $\frac{2}{5}$ s are in 3?



$$3 \div \frac{2}{5} = 3 \times \frac{5}{2} = 7 \frac{1}{2}$$

- 3 (a) $\frac{5}{3}$ is the reciprocal of $\frac{3}{5}$.

- (b) $\frac{3}{5}$ of what number is 3?



$$3 \div \frac{3}{5} = 3 \times \frac{5}{3} = 5$$

- (c) $\frac{3}{5}$ of what number is 5?



$$5 \div \frac{3}{5} = 5 \times \frac{5}{3} = 8 \frac{1}{3}$$

Practice

- 4 Divide.

(a) $3 \div \frac{3}{10} = 10$

(b) $4 \div \frac{2}{5} = 10$

(c) $6 \div \frac{3}{7} = 14$

(d) $60 \div \frac{4}{5} = 75$

- 5 Divide. Express each answer in simplest form.

(a) $7 \div \frac{2}{3} = 10 \frac{1}{2}$

(b) $8 \div \frac{3}{4} = 10 \frac{2}{3}$

(c) $6 \div \frac{4}{5} = 7 \frac{1}{2}$

(d) $60 \div \frac{9}{5} = 33 \frac{1}{3}$

- 6 A sheet of plywood is $\frac{3}{8}$ inches thick. A stack of these sheets of plywood is 9 inches high. How many sheets of plywood are in the stack?

$$9 \div \frac{3}{8} = 24$$

24 sheets of plywood

- 7 Crushed garlic is divided into small containers to be frozen and used later. One of the containers has 5 g of crushed garlic, which is $\frac{2}{9}$ of the total amount of crushed garlic. What is the weight of the total amount of crushed garlic?

$$5 \div \frac{2}{9} = \frac{45}{2} = 22 \frac{1}{2}$$

22½ g

Exercise 6

Basics

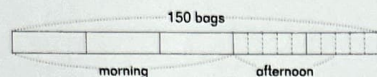
- 1 A farmer had 100 lb of brussels sprouts. He put them into bags each holding $\frac{2}{5}$ lb to sell at the farmer's market. He then sold $\frac{3}{5}$ of the bags in the morning and $\frac{7}{10}$ of the remaining bags in the afternoon.

- (a) How many bags of brussels sprouts did he have?

$$100 \div \frac{2}{5} = 150$$

150 bags

- (b) What fraction of the brussels sprouts did he sell in the afternoon?



$$\frac{7}{10} \times \frac{2}{5} = \frac{7}{25}$$

- (c) How many pounds of brussels sprouts does he have left?

$$\frac{3}{10} \times \frac{2}{5} \times 150 = 18$$

or

$$25 \text{ units} \rightarrow 150$$

$$1 \text{ unit} \rightarrow \frac{150}{25} = 6$$

$$3 \text{ units} \rightarrow 3 \times 6 = 18$$

$$18 \times \frac{2}{5} = 12$$

$$12 \text{ lb}$$



6-6 Word Problems

149

Practice Methods may vary.

- 2 A box with 8 bags of pretzels and a jar of mustard weighs $2\frac{1}{6}$ lb. The jar of mustard weighs $1\frac{3}{8}$ lb and the box alone weighs $\frac{1}{8}$ lb. 5 bags of pretzels were taken out. How many pounds does the box with the remaining bags and jar of mustard now weigh?

$$\text{Weight of mustard and box: } 1\frac{3}{8} + \frac{1}{8} = 1\frac{1}{2}$$

$$\text{Weight of 8 bags: } 2\frac{1}{6} - 1\frac{1}{2} = \frac{2}{3}$$

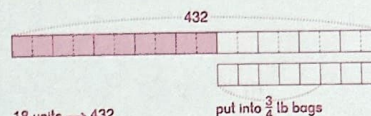
$$\text{Weight of 1 bag: } \frac{2}{3} \div 8 = \frac{1}{12}$$

$$\text{Weight of 3 bags: } 3 \times \frac{1}{12} = \frac{1}{4}$$

$$\text{Total weight: } \frac{1}{4} + 1\frac{1}{2} = 1\frac{3}{4}$$

$1\frac{3}{4}$ lb

- 3 A farm harvested 432 lb of cherries. It sold $\frac{5}{9}$ of the cherries to stores and put $\frac{5}{9}$ of the remainder into bags holding $\frac{3}{4}$ lb, which it sold at a stand for \$4 each. How much money did the farm receive from the sales at the stand?



$$18 \text{ units} \rightarrow 432$$

$$1 \text{ unit} \rightarrow 24$$

$$5 \text{ units} \rightarrow 5 \times 24 = 120$$

$$120 \div \frac{3}{4} = 160$$

$$4 \times 160 = 640$$

$$\$640$$



150

6-6 Word Problems

- 4 Trees are going to be planted along the side of a road. One tree will be planted at the start, then another 30 trees for $\frac{3}{5}$ km total. The remaining stretch of the road will have an additional 25 trees in all planted every $\frac{1}{10}$ km.

- (a) How many kilometers apart from each other will the first 31 trees be?

$$\frac{3}{5} \div 30 = \frac{1}{50}$$

$$\frac{1}{50} \text{ km}$$

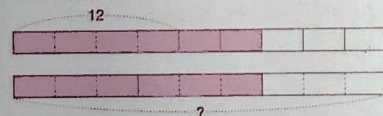
- (b) How long is the road in kilometers?

$$\frac{1}{10} \times 25 = 2\frac{1}{2}$$

$$\frac{3}{5} + 2\frac{1}{2} = \frac{31}{10} = 3\frac{1}{10}$$

$$3\frac{1}{10} \text{ km}$$

- 5 A store sold 12 laptops on Saturday and $\frac{2}{5}$ of its remaining laptops on Sunday. Altogether the store sold $\frac{2}{3}$ of its stock of laptops in those two days. How many laptops did it have at first?



$$4 \text{ units} \rightarrow 12$$

$$9 \text{ units} \rightarrow \frac{12}{4} \times 9 = 27$$

$$27 \text{ laptops}$$

6-6 Word Problems

151

Exercise 7

Check

- 1 Find the values. Express each answer in simplest form.

(a) $5 \div \frac{1}{6}$ 30 (b) $7 \div \frac{1}{8}$ 56

(c) $6 \div \frac{3}{4}$ 8 (d) $12 \div \frac{2}{3}$ 18

(e) $100 \div \frac{4}{5}$ 125 (f) $5 \div \frac{5}{6}$ 6

(g) $4 \div \frac{8}{9}$ $4\frac{1}{2}$ (h) $100 \div \frac{6}{7}$ $116\frac{2}{3}$

(i) $10 \div \frac{2}{3} \times \frac{1}{2}$ $7\frac{1}{2}$ (j) $(2\frac{1}{7} \times 2\frac{1}{3}) \div \frac{7}{10}$ $7\frac{1}{7}$

(k) $35 \div \frac{2}{3} - 17 \div \frac{2}{3}$ 27 (l) $25 \div \frac{1}{2} - 25 \div \frac{2}{3}$ $12\frac{1}{2}$

Methods may vary.

- 2 A sheet of plywood is $\frac{3}{4}$ in thick. A stack of these sheets of plywood is 2 feet high. How many sheets of plywood are in the stack?

2 ft = 24 in

$24 \div \frac{3}{4} = 32$

32 sheets of plywood

- 3 Mariam is cutting 20 inches of yarn into pieces each $\frac{3}{8}$ inch long for an art project. How many $\frac{3}{8}$ inch pieces will she have?

$20 \div \frac{3}{8} = \frac{160}{3} = 53\frac{1}{3}$

53 pieces

- 4 One lap around a track is $\frac{1}{3}$ of a mile. Riya ran 5 miles around the track. How many laps did she run?

$5 \div \frac{1}{3} = 15$

15 laps



Challenge

- 7 A tank was $\frac{1}{4}$ of the way filled of water. After 3 L of water was added, it was $\frac{7}{10}$ full. How many liters of water did it have at first?



$\frac{7}{10} - \frac{1}{4} = \frac{9}{20}$

3 L is $\frac{9}{20}$ of the tank.

$3 \div \frac{9}{20} = \frac{20}{3}$

$\frac{1}{4} \times \frac{20}{3} = \frac{5}{3} = 1\frac{2}{3}$

$1\frac{2}{3}$ L

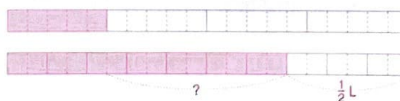
or:

$\frac{9}{20}$ of the tank \rightarrow 3 L

$\frac{1}{20}$ of the tank $\rightarrow \frac{3}{9} = \frac{1}{3}$ L

$\frac{5}{20}$ of the tank $\rightarrow 5 \times \frac{1}{3} = \frac{5}{3} = 1\frac{2}{3}$ L

- 8 A jug was $\frac{1}{4}$ full of water. After some water was added, it was $\frac{7}{10}$ full. It is now $\frac{1}{2}$ L from being full. How many liters of water were added?



$\frac{7}{10} - \frac{1}{4} = \frac{9}{20}$

6 units $\rightarrow \frac{1}{2}$ L

1 unit $\rightarrow \frac{1}{2} \div 6 = \frac{1}{12}$ L

9 units $\rightarrow 9 \times \frac{1}{12} \text{ L} = \frac{3}{4}$ L

$\frac{3}{4}$ L

or:

$\frac{3}{20} \rightarrow \frac{1}{2}$ L

$\frac{1}{10} \rightarrow \frac{1}{6}$ L

$\frac{1}{20} \rightarrow \frac{1}{12}$ L

$\frac{9}{20} \rightarrow 9 \times \frac{1}{12} \text{ L} = \frac{3}{4}$ L



- 9 One small block is $\frac{2}{3}$ of the weight of a large block. How many of the available blocks need to be added to the right side so that it is balanced?



3 small blocks weigh the same as 2 large blocks

Draw a picture:



4 large blocks and 1 small block. 5 blocks in all.

- 10 It would take Steve 4 hours to paint a room. If Andre helps him, they can finish painting the room in 3 hours. How long would Andre take to paint the room by himself?

Steve $\rightarrow \frac{1}{4}$ of the room in 1 hour

Steve and Andre $\rightarrow \frac{1}{3}$ of the room in 1 hour

Andre $\rightarrow \frac{1}{3} - \frac{1}{4} = \frac{1}{12}$ of the room in 1 hour

12 hours

Chapter 7 Measurement

Exercise 1

Basics

- 1 (a) 1 ft = 12 in (b) 1 lb = 16 oz
(c) 1 yd = 3 ft (d) 1 qt = 4 c
(e) 1 gal = 4 qt (f) 1 day = 24 h
(g) 1 h = 60 min (h) 1 min = 60 s
(i) 1 km = 1,000 m (j) 1 L = 1,000 mL
(k) 1 kg = 1,000 g (l) 1 m = 100 cm
(m) 1 cm = 10 mm (n) 1 L = 10 dL

- 2 (a) 3 L = 3 × 1,000 mL = 3,000 mL
(b) $\frac{3}{8}$ L = $\frac{3}{8}$ × 1,000 mL = 375 mL
(c) $3\frac{3}{8}$ L = 3,000 mL + 375 mL = 3,375 mL

- 3 Express $7\frac{3}{4}$ ft in inches.

$$7 \times 12 + \frac{3}{4} \times 12 = 84 + 9 = 93$$

$$7\frac{3}{4} \text{ ft} = 93 \text{ in}$$

Practice

- 4 (a) $4\frac{3}{10}$ km = 4 km 300 m

- (b) $2\frac{3}{4}$ lb = 2 lb 12 oz

- (c) $6\frac{3}{5}$ cm = 6 cm 6 mm

- 5 (a) $2\frac{3}{8}$ lb = 38 oz (b) $3\frac{4}{5}$ min = 228 s

- (c) $6\frac{3}{5}$ km = 6,600 m (d) $5\frac{3}{20}$ m = 515 cm

- (e) $4\frac{1}{2}$ gal = 18 qt (f) $5\frac{2}{3}$ yd = 17 ft

- (g) $2\frac{3}{4}$ kg = 2,750 g (h) $2\frac{1}{2}$ days = 60 h

- 6 A bag of beans weighs $2\frac{1}{2}$ lb. 12 ounces of beans were used for soup, and another $1\frac{1}{8}$ lb of beans were used to make chili. How many ounces of beans are still in the bag?

$$2\frac{1}{2} \text{ lb} = 40 \text{ oz}$$

$$1\frac{1}{8} \text{ lb} = 18 \text{ oz}$$

$$40 \text{ oz} - 12 \text{ oz} - 18 \text{ oz} = 10 \text{ oz}$$

$$10 \text{ oz}$$

- 7 In a 2 h practice, a team spent 10 min on warm up, and $1\frac{2}{3}$ h on drills. How many minutes are left for stretching at the end?

$$2 \text{ h} = 120 \text{ min}$$

$$1\frac{2}{3} \text{ h} = 100 \text{ min}$$

$$120 \text{ min} - 100 \text{ min} - 10 \text{ min} = 10 \text{ min}$$

$$10 \text{ min}$$

- 8 A fathom is 6 ft. The sonar says that a submarine is at a depth of $18\frac{2}{3}$ fathoms. How many feet deep is the submarine?

$$18\frac{2}{3} \times 6 \text{ ft} = 112 \text{ ft}$$

$$112 \text{ ft}$$

- 9 1 mile is 5,280 ft. How many yards are in $\frac{3}{4}$ miles?

$$\frac{3}{4} \times 5,280 \div 3 = 1,320$$

$$1,320 \text{ yd}$$

Exercise 2

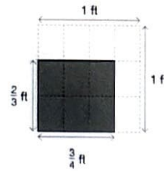
Basics

- 1 What is the area of a rectangle that is $\frac{3}{4}$ ft long and $\frac{2}{3}$ ft wide in square feet?

$$\frac{3}{4} \times \frac{2}{3} = \frac{6}{12}$$

$$= \frac{1}{2}$$

$$\text{Area} = \frac{1}{2} \text{ ft}^2$$



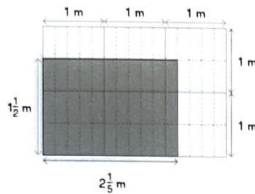
- 2 What is the area of a rectangle that is $2\frac{1}{5}$ m long and $1\frac{1}{2}$ m wide in square meters?

$$2\frac{1}{5} \times 1\frac{1}{2} = \frac{11}{5} \times \frac{3}{2}$$

$$= \frac{33}{10}$$

$$= 3\frac{3}{10}$$

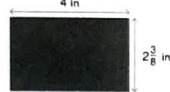
$$\text{Area} = 3\frac{3}{10} \text{ m}^2$$



- 3 What is the area of a rectangle that is 4 in long and $2\frac{3}{8}$ in wide?

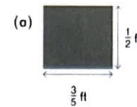
$$4 \times 2\frac{3}{8} = 4 \times \frac{19}{8} = \frac{19}{2} = 9\frac{1}{2}$$

$$\text{Area} = 9\frac{1}{2} \text{ in}^2$$



Practice

- 4 Find the area of each figure.



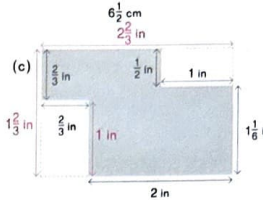
$$\frac{3}{5} \times \frac{1}{2} = \frac{3}{10}$$

$$\frac{3}{10} \text{ ft}^2$$



$$6\frac{1}{2} \times 2\frac{2}{5} = 15\frac{3}{5}$$

$$15\frac{3}{5} \text{ cm}^2$$



$$1\frac{1}{8} \times 2 = 2\frac{1}{4}$$

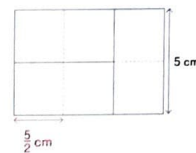
$$1 \times \frac{1}{2} = \frac{1}{2}$$

$$1 \times \frac{1}{8} = \frac{1}{8}$$

$$4\frac{9}{8} \times \frac{1}{2} = 2\frac{9}{8}$$

$$3\frac{5}{8} \text{ in}^2$$

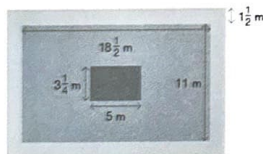
- 5 The figure is made up of 3 identical rectangles. What is the area of the figure?



$$5 \times \frac{15}{2} = 37\frac{1}{2}$$

$$37\frac{1}{2} \text{ cm}^2$$

- 6 A gravel path, $1\frac{1}{2}$ m wide, surrounds a grass lawn, $18\frac{1}{2}$ m by 11 m. A garden shed in the middle of the lawn is 5 m by $3\frac{1}{4}$ m.



- (a) What is the area of the path in square meters?

$$18\frac{1}{2} + (2 \times 1\frac{1}{2}) = 21\frac{1}{2}; 11 + (2 \times 1\frac{1}{2}) = 14$$

$$\text{Area of large rectangle: } 21\frac{1}{2} \times 14 = 301$$

$$\text{Area of rectangle inside the path: } 18\frac{1}{2} \times 11 = 203\frac{1}{2}$$

$$301 - 203\frac{1}{2} = 97\frac{1}{2}$$

$$97\frac{1}{2} \text{ m}^2$$

- (b) What is the area that has grass growing in square meters?

$$\text{Area of shed: } 5 \times 3\frac{1}{4} = 16\frac{1}{4}$$

$$203\frac{1}{2} - 16\frac{1}{4} = 187\frac{1}{4}$$

$$187\frac{1}{4} \text{ m}^2$$

- 7 Aiden is painting a rectangular wall that is $15\frac{1}{2}$ ft by $12\frac{1}{2}$ ft. He needs 1 quart of paint for every 60 square feet of wall. How many 1-quart cans does he need to buy?

$$\text{Area of wall: } 15\frac{1}{2} \times 12\frac{1}{2} = \frac{76}{2} \times \frac{25}{2} = 190; 190 \text{ ft}^2$$

$$190 \div 60 = 3\frac{1}{6}$$

$$4 \text{ cans}$$

Exercise 3

Check

- 1 Anthony's cat slept for $\frac{2}{3}$ of the time between 6:00 a.m. one morning to 6:00 a.m. the next morning. How many hours did it sleep?

$$\frac{2}{3} \times 24 = 16$$

16 hours

- 2 Tyler read for $1\frac{2}{3}$ h in the afternoon and $\frac{3}{4}$ h before bed. How many minutes did he spend reading that day?

$$1\frac{2}{3} \times 60 \text{ min} + \frac{3}{4} \times 60 \text{ min} = 100 \text{ min} + 45 \text{ min} = 145 \text{ min}$$

145 min

- 3 Diego's time for a 100-m sprint was $\frac{3}{5}$ min. Adam took $\frac{5}{6}$ as long as Diego to complete the same sprint. How many seconds did Adam take to sprint 100 meters?

$$\frac{5}{6} \times \frac{3}{5} \times 60 = 30$$

30 s

- 4 The area of a rectangle is 2 ft². One side is $\frac{3}{4}$ ft long. What is the length of the other side in inches?

$$2 \div \frac{3}{4} = 2\frac{2}{3}$$

$$2\frac{2}{3} \times 12 \text{ in} = 32 \text{ in}$$

32 in

- 5 A recipe calls for $\frac{2}{3}$ of a stick of butter. Natasha wants to double the recipe. 4 sticks of butter weigh 1 pound. How many ounces of butter will she use?

1 stick of butter is $\frac{1}{4}$ lb.

$$2 \times \frac{2}{3} = \frac{4}{3}; \frac{4}{3} \text{ sticks of butter are needed.}$$

$$\frac{4}{3} \times \frac{1}{4} \text{ lb} = \frac{1}{3} \text{ lb}$$

$$\frac{1}{3} \times 16 = \frac{16}{3} = 5\frac{1}{3}$$

5 $\frac{1}{3}$ oz

- 6 A rectangle is $2\frac{1}{2}$ ft long and $1\frac{2}{3}$ ft wide.

- (a) What is its area in square feet?

$$2\frac{1}{2} \times 1\frac{2}{3} = \frac{5}{2} \times \frac{5}{3} = \frac{25}{6} = 4\frac{1}{6}$$

4 $\frac{1}{6}$ ft²

- (b) What is its area in square inches?

$$2\frac{1}{2} \times 12 \text{ in} = 26 \text{ in}$$

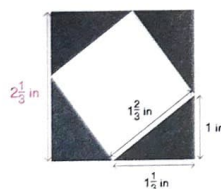
$$1\frac{2}{3} \times 12 \text{ in} = 20 \text{ in}$$

$$26 \times 20 = 520$$

520 in²

Challenge

- 7 When four identical right triangles are arranged as follows, a square inside a square is formed. What is the area of the shaded part of the figure in square inches?



$$2\frac{1}{5} \times 2\frac{1}{5} = \frac{7}{5} \times \frac{7}{5} = \frac{49}{25}$$

$$1\frac{1}{3} \times 1\frac{1}{3} = \frac{4}{3} \times \frac{4}{3} = \frac{16}{9}$$

$$\frac{49}{25} - \frac{16}{9} = \frac{441}{225} - \frac{400}{225} = \frac{41}{225}$$

$\frac{41}{225} \text{ in}^2$

- 8 In medieval times, a "moment" was $\frac{1}{10}$ of a "point." A point was 15 minutes.

- (a) How many minutes is a moment?

$$\frac{1}{10} \times 15 = 1\frac{1}{2}$$

1 $\frac{1}{2}$ min

- (b) How many seconds is a moment?

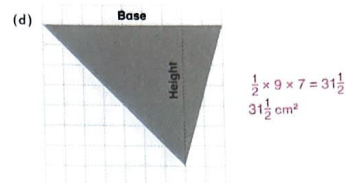
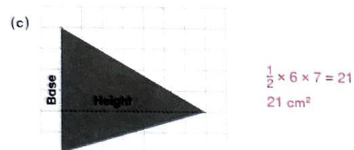
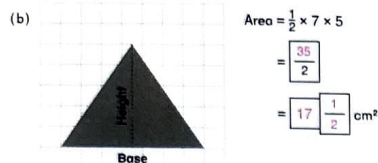
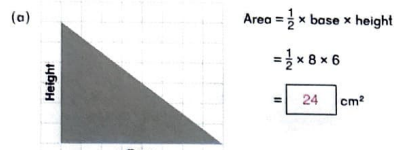
$$1\frac{1}{2} \times 60 = 90$$

90 s

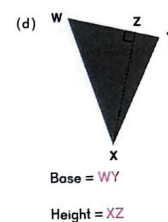
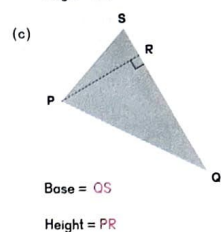
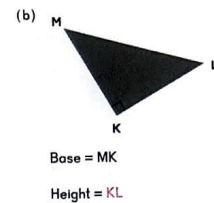
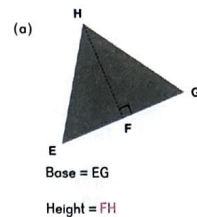
Exercise 4

Basics

1 Find the area of each triangle. Each square represents 1 cm^2 .

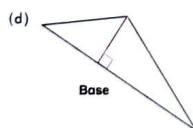
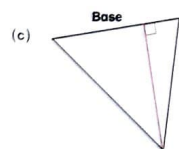
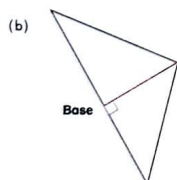
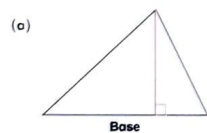


2 For each triangle, identify a base (if required) and a corresponding height.

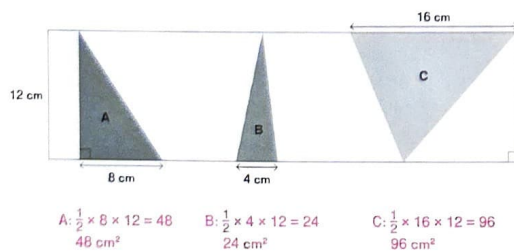


Practice

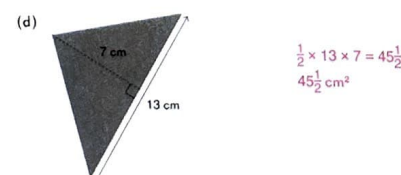
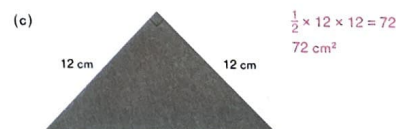
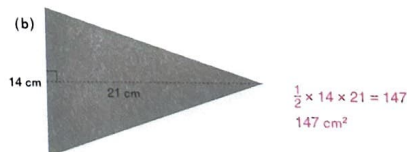
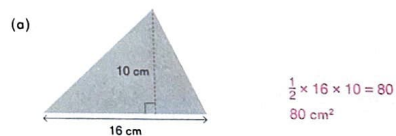
3 Draw a height for the given base of each of these triangles.



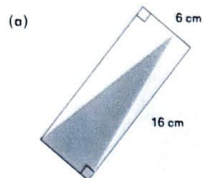
4 Find the area of each shaded triangle.



5 Find the area of each triangle.

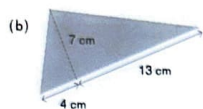


- 6 Find the area of each triangle.



$$\frac{1}{2} \times 6 \times 16 = 48$$

$$48 \text{ cm}^2$$



$$\frac{1}{2} \times 4 \times 7 = 14$$

$$14 \text{ cm}^2$$

Challenge

- 7 (a) A triangle has a base of 5 cm and an area of 20 cm^2 . What is its height?

$$\frac{1}{2} \times 5 \times h = 20$$

$$5 \times h = 40$$

$$h = 8$$

$$8 \text{ cm}$$

- (b) A triangle has a height of 3 cm and an area of $7\frac{1}{2} \text{ cm}^2$. What is its base?

$$\frac{1}{2} \times b \times 3 = 7\frac{1}{2}$$

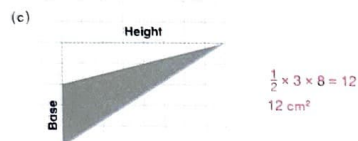
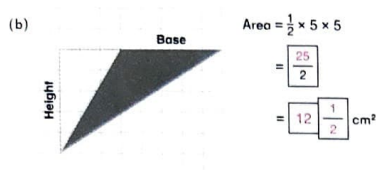
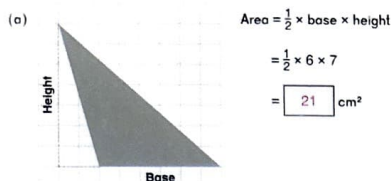
$$b \times 3 = 15, \text{ so } b \text{ must be } 5.$$

$$5 \text{ cm}$$

Exercise 5

Basics

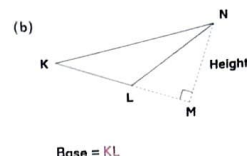
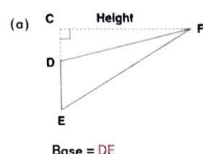
- 1 Find the area of each triangle. Each square represents 1 cm².



7-5 Area of a Triangle — Part 2

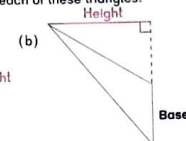
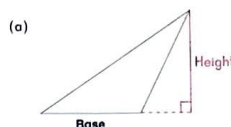
171

- 2 For each triangle, identify a base for the given height.

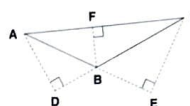


Practice

- 3 Draw a height for the given base of each of these triangles.



- 4 Identify the height of each given base.



If the base is AB, the height is EC.

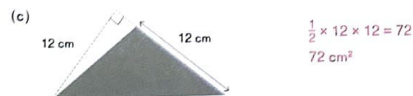
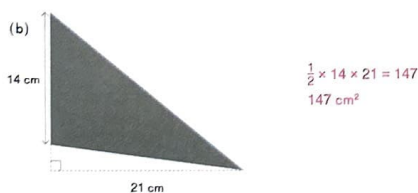
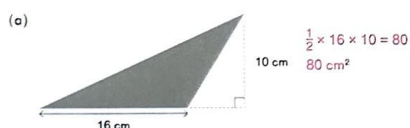
If the base is BC, the height is AD.

If the base is CA, the height is FB.

7-5 Area of a Triangle — Part 2

172

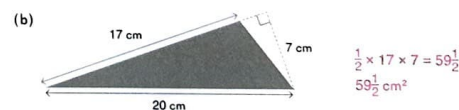
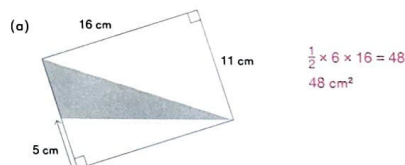
- 5 Find the area of each triangle.



7-5 Area of a Triangle — Part 2

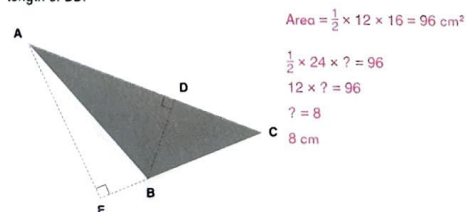
173

- 6 Find the area of each shaded triangle.



Challenge

- 7 In the following figure, AC = 24 cm, BC = 12 cm, and AE = 16 cm. Find the length of BD.



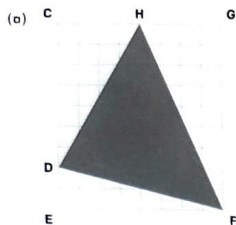
7-5 Area of a Triangle — Part 2

174

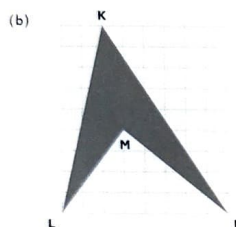
Exercise 6

Basics

- 1 Find the area of the shaded figures. Each square represents 1 cm^2 .

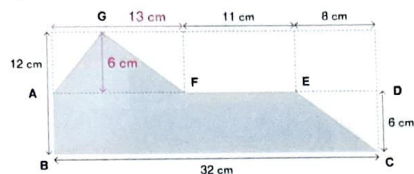


Area of Rectangle CEFG:
 $9 \times 8 = 72 \text{ cm}^2$
 Area of Triangle CDH:
 $\frac{1}{2} \times 4 \times 7 = 14 \text{ cm}^2$
 Area of Triangle DEF:
 $\frac{1}{2} \times 2 \times 8 = 8 \text{ cm}^2$
 Area of Triangle HFG:
 $\frac{1}{2} \times 4 \times 9 = 18 \text{ cm}^2$
 Area of Triangle HDF:
 $72 - 14 - 8 - 18 = 32 \text{ cm}^2$



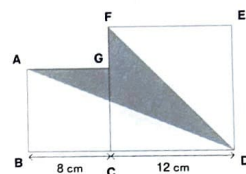
Area of Triangle LKN:
 $\frac{1}{2} \times 8 \times 9 = 36 \text{ cm}^2$
 Area of Triangle LMN:
 $\frac{1}{2} \times 8 \times 4 = 16 \text{ cm}^2$
 Area of Figure KLMN:
 $36 - 16 = 20 \text{ cm}^2$

- 2 Find the area of the shaded figure.



Area of Rectangle ABCD: $32 \times 6 = 192 \text{ cm}^2$
 Area of Triangle AFG: $\frac{1}{2} \times 13 \times 6 = 39 \text{ cm}^2$
 Area of Triangle CDE: $\frac{1}{2} \times 8 \times 6 = 24 \text{ cm}^2$
 Area of Figure ABCEFG: $192 + 39 - 24 = 207 \text{ cm}^2$

- 3 The figure below is made up of two squares, ABCG and FCDE. Find the area of the shaded part.



Area of Triangle ABD:
 $\frac{1}{2} \times 20 \times 8 = 80 \text{ cm}^2$
 Area of Triangle FDE:
 $\frac{1}{2} \times 12 \times 12 = 72 \text{ cm}^2$
 Area of both squares:
 $8 \times 8 + 12 \times 12 = 208 \text{ cm}^2$
 Area of Figure ADFG:
 $208 - 80 - 72 = 56 \text{ cm}^2$

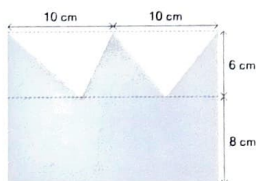
Practice

- 4 Find the area of the shaded figure. Each square represents 1 cm^2 .



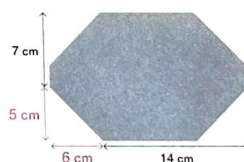
$9 \times 5 = 45$
 $\frac{1}{2} \times 7 \times 4 = 14$
 $\frac{1}{2} \times 2 \times 5 = 5$
 $\frac{1}{2} \times 1 \times 9 = 4\frac{1}{2}$
 $45 - 14 - 5 - 4\frac{1}{2} = 21\frac{1}{2}$
 $21\frac{1}{2} \text{ cm}^2$

- 5 Find the area of the shaded figure.



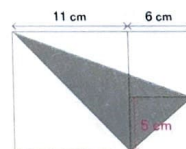
$20 \times 14 = 280$
 $2 \times \frac{1}{2} \times 10 \times 6 = 60$
 $280 - 60 = 220$
 220 cm^2

- 6 4 identical triangles are cut from the corners of a rectangular paper that is 20 cm long and 12 cm wide. What is the area of the paper left?



$20 \times 12 = 240$
 $4 \times \frac{1}{2} \times 5 \times 6 = 60$
 $240 - 60 = 180$
 180 cm^2

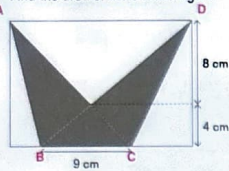
- 7 The figure below shows two squares. Find the area of the shaded triangle.



$\frac{1}{2} \times 11 \times 11 = 60\frac{1}{2}$
 $\frac{1}{2} \times 17 \times 6 = 51$
 $11 \times 11 + 6 \times 6 = 157$
 $\frac{1}{2} \times 6 \times 5 = 15$
 $157 - 51 - 60\frac{1}{2} + 15 = 60\frac{1}{2}$
 $60\frac{1}{2} \text{ cm}^2$

Challenge

- 8 Find the area of the shaded figure.



Find the areas of triangles ABC and BCD and subtract the overlap.

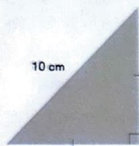
$$2 \times \frac{1}{2} \times 9 \times 12 = 108$$

$$\frac{1}{2} \times 9 \times 4 = 18$$

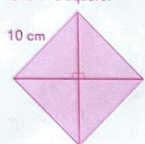
$$108 - 18 = 90$$

$$90 \text{ cm}^2$$

- 9 What is the area of the triangle shown below?



4 triangles can be arranged to form a square.



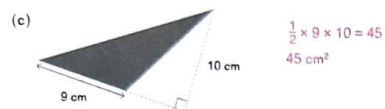
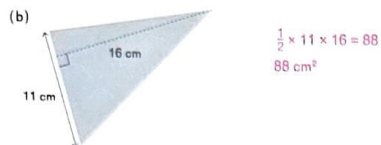
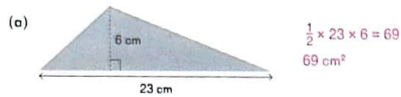
$$\frac{1}{4} \times 10 \times 10 = 25$$

$$25 \text{ cm}^2$$

Exercise 7

Check

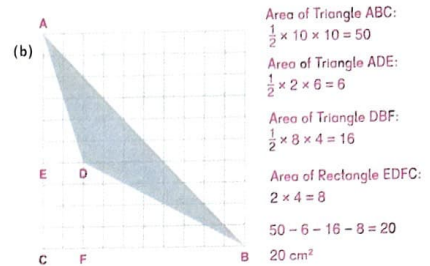
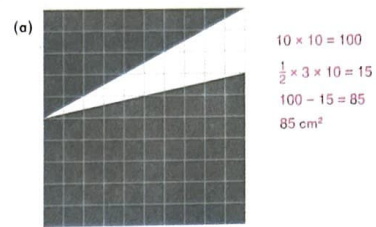
- 1 Find the area of each triangle.



180

7-7 Practice B

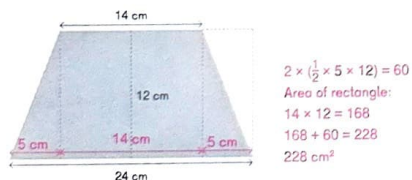
- 2 Find the shaded areas. Each square represents 1 cm^2 .



7-7 Practice B

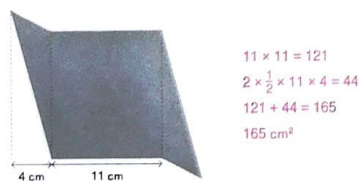
181

- 3 The figure is made from a rectangle and 2 identical right triangles. Find the area.



Or: Slide and rotate one of the two triangles to make large rectangle with sides 12 cm and 19 cm. $12 \times 19 = 228$

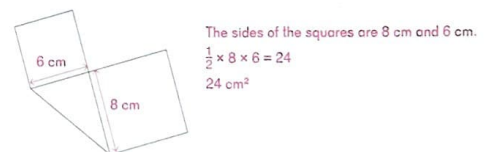
- 4 The figure is made from a square and two identical triangles. Find the area.



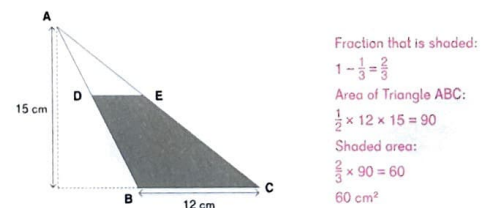
182

7-7 Practice B

- 5 The figure is made from two squares and a right triangle. The areas of the two squares are 64 cm^2 and 36 cm^2 . What is the area of the triangle?



- 6 The area of Triangle ADE is $\frac{1}{3}$ the area of Triangle ABC. Find the shaded area.

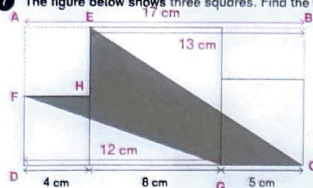


7-7 Practice B

183

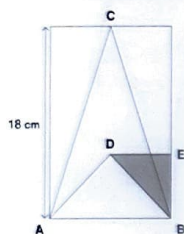
Challenge

- 7 The figure below shows three squares. Find the area of the shaded part.



$$\begin{aligned} \text{Area of Rectangle } ABCD: 17 \times 8 &= 136 \\ \text{Area of Triangle } EBC: \frac{1}{2} \times 13 \times 8 &= 52 \\ \text{Area of Triangle } FGD: \frac{1}{2} \times 12 \times 4 &= 24 \\ \text{Area of Square } AEHF: 4 \times 4 &= 16 \\ 136 - 52 - 24 - 16 &= 44 \\ 44 \text{ cm}^2 \end{aligned}$$

- 8 The area of triangle ABC is 3 times the area of Triangle ABD. Triangle DBE is an isosceles right triangle. Find the area of Triangle DBE.




Triangles ABC and ABD have the same base, so if ABC is 3 times the area of ABD, then its height is 3 times the height of ABD. BE is therefore 6 cm.
Area = $\frac{1}{2} \times 6 \times 6 = 18 \text{ cm}^2$

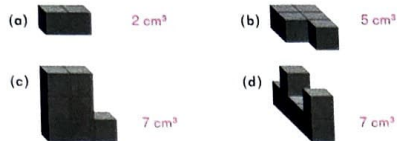
Chapter 8 Volume of Solid Figures

Exercise 1

Basics

- 1 A cube that is 1 cm on each side has a volume of 1 cubic centimeter, which is written as 1 cm^3 . 

- 2 The following solid figures were made using 1-cm cubes. Find the volumes.



- 3 6 cubes are needed to build this solid. One cube is hidden under a top block.



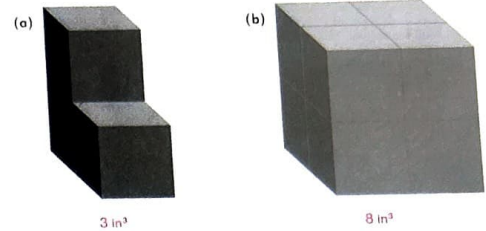
- 4 Find the volumes of the following solid figures, which were made using 1-cm cubes.



8-1 Cubic Units

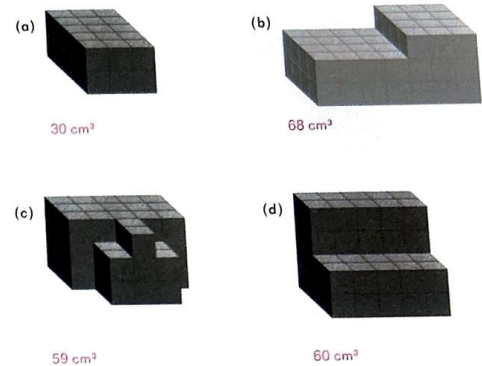
185

- 5 The following solid figures were made using 1-inch cubes. Find the volumes.



Practice

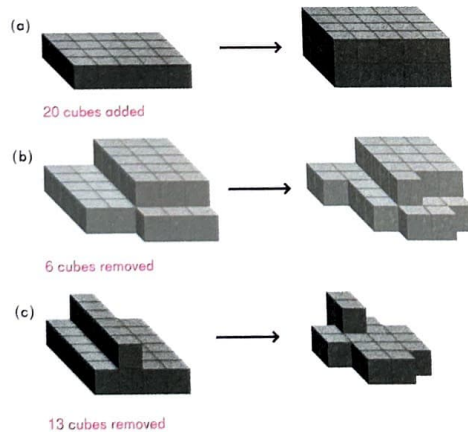
- 6 The following solid figures were made using 1-cm cubes. Find the volumes.



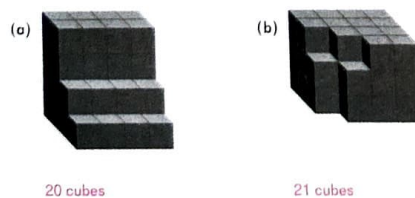
8-1 Cubic Units

186

- 7 How many cubes were added to or removed from the solid on the left to create the solid on the right?



- 8 How many unit cubes need to be added to each figure to make a larger cube that has a length, width, and height each of 4 units?



8-1 Cubic Units

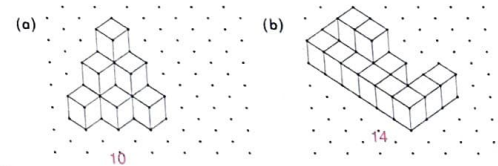
187

Challenge

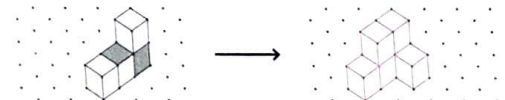
The following shows some different ways cubes can be drawn using dot grids. The two cubes on the left each have a face facing forward, whereas the cube on the right has an edge facing forward.



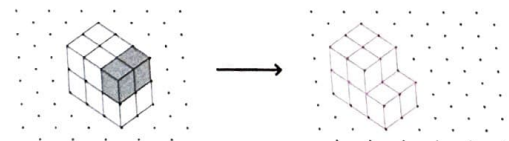
- 9 How many unit cubes are needed to build each of the following figures?



- 10 Draw the figure that you will see when one unit cube is added to each of the shaded faces.



- 11 Draw the figure that you will see when the shaded cubes are removed.



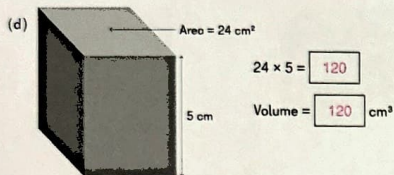
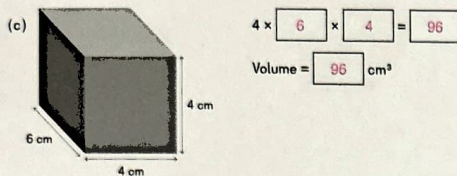
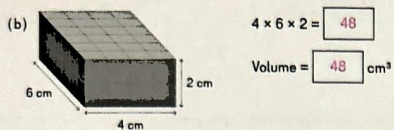
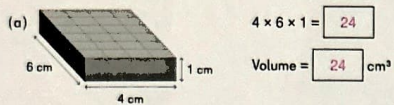
188

8-1 Cubic Units

Exercise 2

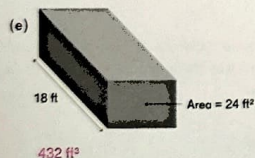
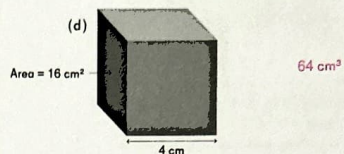
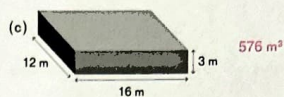
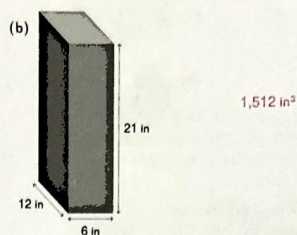
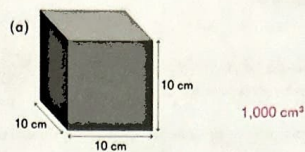
Basics

1 Find the volume of the solid figures. Each was made using 1-cm cubes.

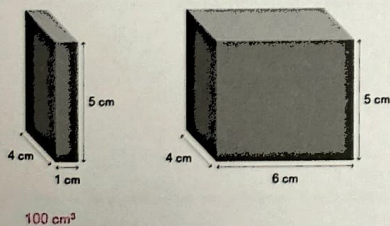


Practice

2 Find the volume of each cuboid.



3 What is the difference in volume between these two cuboids?



4 A cube is 9 cm long on each side. A cuboid is 9 cm by 8 cm by 10 cm. Which solid has a greater volume, and by how much?
cube: 729 cm^3 cuboid: 720 cm^3
cube by 9 cm^3

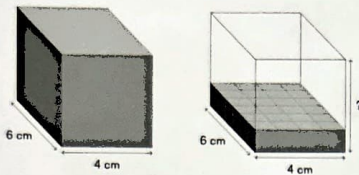
Challenge

5 A crate has the dimensions of 24 inches by 16 inches by 12 inches. How many 2-inch cubes can it hold?
 $12 \times 8 \times 6 = 576$
576 2-inch cubes

Exercise 3

Basics

- 1 The volume of this cuboid is 96 cm^3 . The bottom face is 6 cm by 4 cm. What is the height of the cuboid?

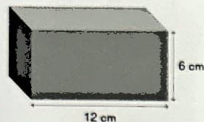


Number of 1-cm cubes in the bottom layer: 6×4

Number of layers of cubes: $96 \div (6 \times 4) = \frac{96}{6 \times 4} = 4$

Height = 4 cm

- 2 The volume of this cuboid is 432 cm^3 . Its height is 6 cm and its length is 12 cm. What is the width of the cuboid?

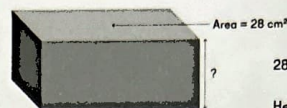


$$12 \times 6 \times \text{Width} = 432$$

$$\text{Width} = \frac{432}{12 \times 6} = 6$$

$$\text{Width} = 6 \text{ cm}$$

- 3 The volume of a cuboid is 84 cm^3 . The top face has an area of 28 cm^2 . What is the height of the cuboid?



$$28 \times \text{Height} = 84$$

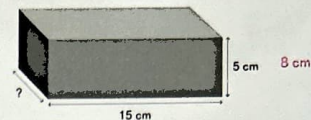
$$\text{Height} = \frac{84}{28} = 3$$

$$\text{Height} = 3 \text{ cm}$$

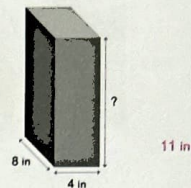
Practice

- 4 Find the length of the unknown edge of each cuboid.

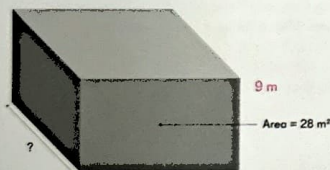
- (a) Volume = 600 cm^3



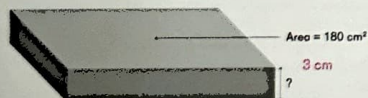
- (b) Volume = 352 in^3



- (c) Volume = 252 m^3



- (d) Volume = 540 cm^3



- 5 A shipping container is 20 ft long and 8 ft wide with a volume of $1,360 \text{ ft}^3$. How high is it in feet?

$$\frac{1360}{20 \times 8} = 8\frac{1}{2}$$

$$8\frac{1}{2} \text{ ft}$$

Challenge

- 6 A rectangular container has a volume of 468 cm^3 . The base is a square with an area of 36 cm^2 . How many 2-cm cubes can fit in the container?

Height: 13 cm

6 2-cm cubes can fit along the height and 3 along the width and length.

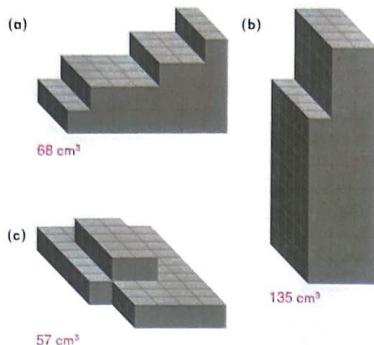
$$3 \times 3 \times 6 = 54$$

54 2-cm cubes

Exercise 4

Check

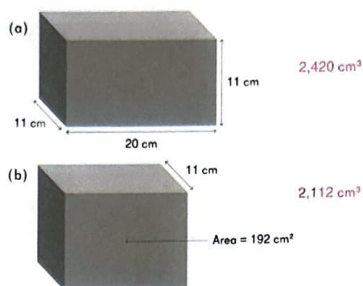
- 1 The following solid figures were made using 1-cm cubes. Find the volumes.



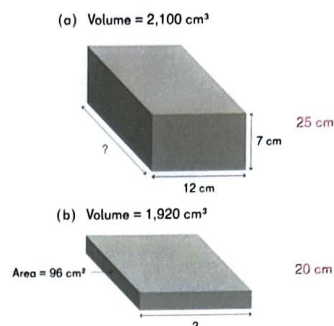
- 2 How many cubes need to be added to the figure below to make a cuboid with a base area of 30 square units and a height of 4 units?



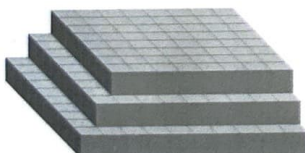
- 3 Find the volume of each cuboid.



- 4 Find the length of the unknown edge of each cuboid.



- 5 The base of a crate has an area of 1,200 ft². The volume of the crate is 30,000 ft³. What is its height?
 $\frac{30,000}{1,200} = 25$
 25 ft
- 6 A solid is made up of 8 cubes each with an edge of 4 cm. What is the volume of the solid?
 $8 \times 4 \times 4 \times 4 = 512$
 512 cm³
- 7 Each layer of a structure forms a square. The bottom layer has 100 1-cm cubes. The next layer up has 81 cubes, and the next layer up has 64 cubes. This pattern continues until the top layer has 16 cubes.



- (a) What is the volume of the entire structure?
 $100 + 81 + 64 + 49 + 36 + 25 + 16 = 371$
 371 cm³
- (b) How many more cubes need to be added to have a larger cube with sides 10 cm long?
 $10 \times 10 \times 10 = 1,000$
 $1,000 - 371 = 629$
 629 more cubes

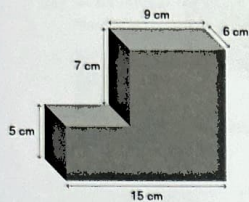
Challenge

- 8 3 metal cubes are 3 cm, 4 cm, and 5 cm long. They were melted and recast into one new cube. What is the length of the new cube?
 $(3 \times 3 \times 3) + (4 \times 4 \times 4) + (5 \times 5 \times 5) = 27 + 64 + 125 = 216$
 216 is less than 1,000, so it will be a length between 6 and 9.
 Students can try $6 \times 6 \times 6$ and see that works.
 6 cm
- 9 How many 2-cm cubes can be put in a rectangular container measuring 20 cm by 15 cm by 12 cm?
 The number of cubes along the 20 cm edge is 10, along the 12-cm edge is 6, and the greatest number along the 15 cm edge is 7.
 $10 \times 6 \times 7 = 420$
 420 2-cm cubes
- 10 Twenty-four 4-cm cubes are used to make a solid. If 2-cm cubes were used instead, how many cubes would be needed?
 $4 \times 4 \times 4 = 64$, and $2 \times 2 \times 2 = 8$. The 4-cm cube is 8 times larger.
 So 8 times as many 2-cm cubes are needed.
 $8 \times 24 = 192$
 192 2-cm cubes

Exercise 5

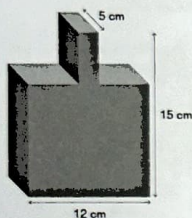
Basics

- 1 A block with a width of 6 cm, a length of 9 cm, and a height of 7 cm is placed on top of another block with the same width, but with a length of 15 cm and a height of 5 cm. What is the volume of the structure?



$$\begin{aligned} 9 \times 6 \times 7 &= 378 \\ 15 \times 6 \times 5 &= 450 \\ 378 + 450 &= 828 \\ \text{Volume} &= 828 \text{ cm}^3 \end{aligned}$$

- 2 Two cubes with lengths of 5 cm are cut from a cuboid that is 12 cm by 5 cm by 15 cm. What is the volume of the remaining solid?

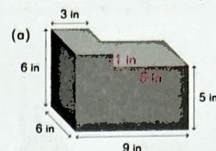


$$\begin{aligned} 12 \times 5 \times 15 &= 900 \\ 2 \times (5 \times 5 \times 5) &= 250 \\ 900 - 250 &= 650 \\ \text{Volume} &= 650 \text{ cm}^3 \end{aligned}$$

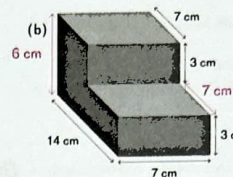
Practice

Methods may vary.

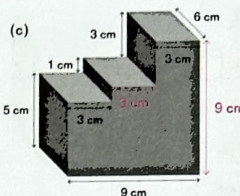
- 3 Find the volume of each solid figure.



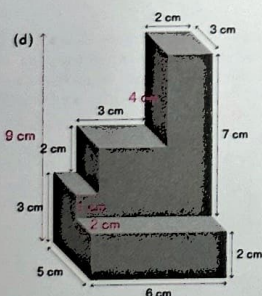
$$\begin{aligned} (9 \times 6 \times 6) - (6 \times 6 \times 1) \\ &= 324 - 36 \\ &= 288 \\ &= 288 \text{ in}^3 \end{aligned}$$



$$\begin{aligned} (7 \times 14 \times 3) + (7 \times 7 \times 3) \\ &= 294 + 147 \\ &= 441 \\ &= 441 \text{ cm}^3 \end{aligned}$$

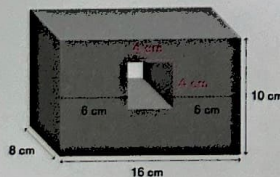


$$\begin{aligned} (9 \times 6 \times 9) - (3 \times 6 \times 4) - (3 \times 6 \times 3) \\ &= 486 - 72 - 54 \\ &= 360 \\ &= 360 \text{ cm}^3 \end{aligned}$$



$$\begin{aligned} (6 \times 5 \times 2) + (6 \times 3 \times 7) - (1 \times 3 \times 6) \\ &= 60 + 126 - 18 - 36 \\ &= 132 \\ &= 132 \text{ cm}^3 \end{aligned}$$

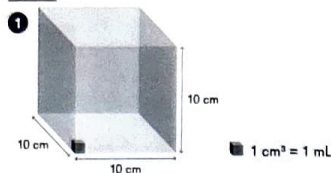
- 4 A cuboid has a cuboid hole in it. The front and back faces of the hole are squares. Find the volume of the remaining solid.



$$\begin{aligned} (16 \times 8 \times 10) - (4 \times 4 \times 4) \\ &= 1,280 - 64 \\ &= 1,216 \\ &= 1,216 \text{ cm}^3 \end{aligned}$$

Exercise 6

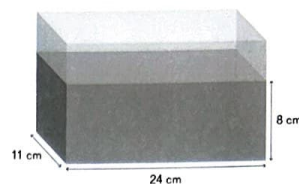
Basics



- (a) What is the volume of this tank in cubic centimeters? $1,000 \text{ cm}^3$
- (b) What is its capacity in milliliters? $1,000 \text{ mL}$
- (c) What is its capacity in liters? 1 L

- 2 (a) $40 \text{ cm}^3 = 40 \text{ mL}$
- (b) $400 \text{ cm}^3 = 400 \text{ mL}$
- (c) $4,000 \text{ cm}^3 = 4,000 \text{ mL} = 4 \text{ L}$
- (d) $4,030 \text{ cm}^3 = 4,030 \text{ mL} = 4 \text{ L } 30 \text{ mL}$
- (e) $850 \text{ mL} = 850 \text{ cm}^3$
- (f) $1 \text{ L } 850 \text{ mL} = 1,850 \text{ mL} = 1,850 \text{ cm}^3$
- (g) $1 \text{ L } 85 \text{ mL} = 1,085 \text{ mL} = 1,085 \text{ cm}^3$

- 3 A rectangular tank is partially filled with water to a depth of 8 cm. Find the volume of water in the tank in liters and milliliters.



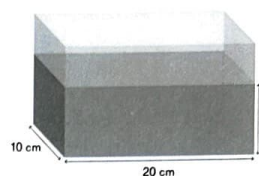
$$24 \times 11 \times 8 = 2,112$$

$$\text{Volume} = 2,112 \text{ cm}^3$$

$$\text{Volume} = 2 \text{ L } 112 \text{ mL}$$

Practice

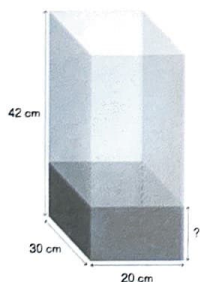
- 4 A rectangular container, 20 cm long and 10 cm wide, contains 1 L 400 mL of water. What is the height of the water?



$$\frac{1,400}{20 \times 10} = 7$$

$$7 \text{ cm}$$

- 5 A rectangular container, 20 cm by 30 cm by 42 cm, is filled completely with water. 18 L of water is then poured out. What is the height of the water left in the container?



$$20 \times 30 \times 42 = 25,200 = 25 \text{ L } 200 \text{ mL}$$

$$25 \text{ L } 200 \text{ mL} - 18 \text{ L} = 7 \text{ L } 200 \text{ mL} = 7,200 \text{ cm}^3$$

$$\frac{7,200}{20 \times 30} = 12$$

$$12 \text{ cm}$$

- 6 A rectangular tank 15 cm long, 10 cm wide, and 40 cm high is $\frac{4}{5}$ full of water. How many more liters and milliliters of water are needed to fill the tank completely?

$$\frac{1}{5} \times 40 = 8$$

$$15 \times 10 \times 8 = 1,200$$

$$1,200 \text{ cm}^3 = 1 \text{ L } 200 \text{ mL}$$

$$1 \text{ L } 200 \text{ mL}$$

$$\text{or:}$$

$$15 \times 10 \times 40 = 6,000 \text{ cm}^3$$

$$6,000 \text{ cm}^3 = 6,000 \text{ mL}$$

$$\frac{1}{5} \times 6,000 = 1,200 \text{ mL}$$

$$1 \text{ L } 200 \text{ mL}$$

- 7 A bottle containing 2 L of water is poured into a rectangular tank with a base area of 240 cm^2 and a height of 12 cm until the tank is $\frac{2}{3}$ full. How much water is left in the bottle?

$$\frac{2}{3} \times 12 = 8$$

$$240 \times 8 = 1,920$$

$$2,000 - 1,920 = 80$$

$$80 \text{ mL}$$

$$\text{or:}$$

$$\frac{2}{3} \times 240 \times 12 = 1,920$$

$$2,000 - 1,920 = 80$$

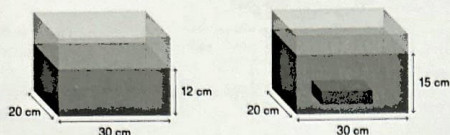
$$80 \text{ mL}$$

Exercise 7

Basics

- 1 A rectangular tank with a base area of 30 cm by 20 cm is filled with water to a height of 12 cm.

- (a) An object is placed in the tank and the water rises to 15 cm. What is the volume of the object?

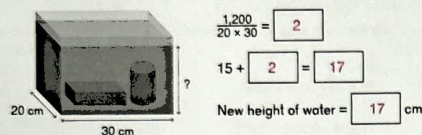


$$\text{Increase in height of water level} = 15 - 12 = 3$$

$$\text{Volume of water displaced} = 30 \times 20 \times 3 = 1,800$$

$$\text{Volume of object} = 1,800 \text{ cm}^3$$

- (b) Another object with a volume of 1,200 cm³ is added to the tank. What will be the new height of the water?



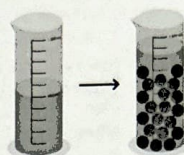
$$\frac{1,200}{20 \times 30} = 2$$

$$15 + 2 = 17$$

$$\text{New height of water} = 17 \text{ cm}$$

Practice

- 2 A measuring cylinder had 500 mL of water in it. After 20 identical glass marbles were added, the water level was 840 mL.



- (a) What is the volume of the 20 marbles?

$$840 - 500 = 340$$

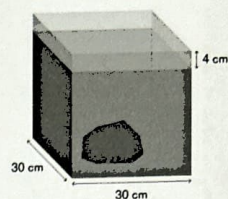
$$340 \text{ cm}^3$$

- (b) What is the volume of a single marble?

$$340 \div 20 = 17$$

$$17 \text{ cm}^3$$

- 3 A cubical container with sides of 30 cm was $\frac{2}{3}$ filled with water. After an object was placed in it, the water level rose to 4 cm from the top. What is the volume of the object?



$$30 - 4 = 26$$

$$\frac{2}{3} \times 30 = 20$$

$$26 - 20 = 6$$

$$\text{The water rose 6 cm.}$$

$$30 \times 30 \times 6 = 5,400$$

$$5,400 \text{ cm}^3$$

- 4 William put water in a rectangular tank and then added identical game tokens until the water rose by 2 cm. The base of the tank measures 10 cm by 8 cm. He added 12 game tokens in all. What is the volume of 1 game token?

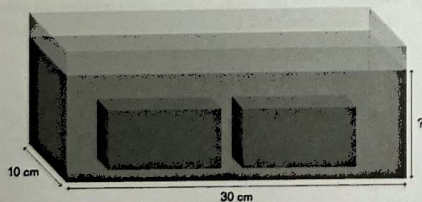
$$10 \times 8 \times 2 = 160$$

$$\frac{160}{12} = 13\frac{1}{3}$$

$$13\frac{1}{3} \text{ cm}^3$$



- 5 A rectangular container, 30 cm long and 10 cm wide, contains 2 L 400 mL of water. Two identical cuboids with the dimensions of 10 cm by 3 cm by 5 cm are in the water. What is the height of the water?



$$\frac{2,400}{10 \times 30} = 8$$

$$2 \times (10 \times 5 \times 3) = 300$$

$$\frac{300}{10 \times 30} = 1$$

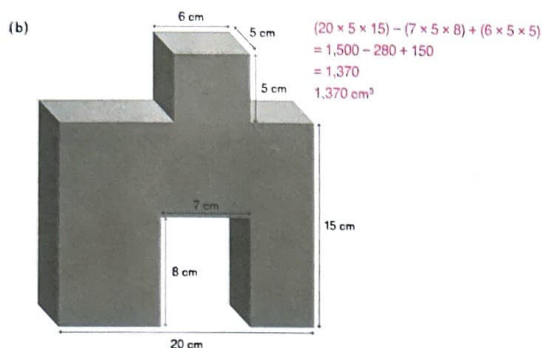
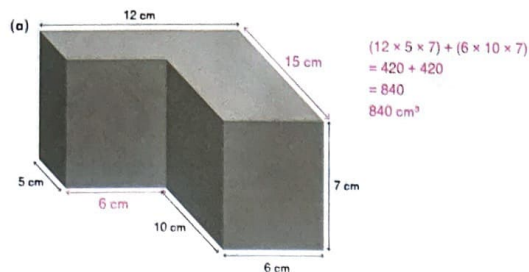
$$8 + 1 = 9$$

$$9 \text{ cm}$$

Exercise 8

Check Methods may vary.

1 Find the volume of each solid figure.

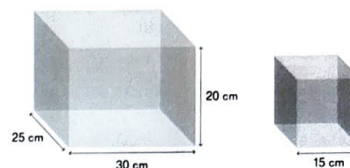


208

8-8 Practice B

- 2 (a) $64 \text{ cm}^3 = \boxed{64} \text{ mL}$
 (b) $3,420 \text{ cm}^3 = \boxed{3} \text{ L } \boxed{420} \text{ mL}$
 (c) $6,007 \text{ cm}^3 = \boxed{6} \text{ L } \boxed{7} \text{ mL}$
 (d) $98 \text{ mL} = \boxed{98} \text{ cm}^3$
 (e) $6 \text{ L} = \boxed{6,000} \text{ cm}^3$
 (f) $1 \text{ L } 20 \text{ mL} = \boxed{1,020} \text{ cm}^3$
 (g) $4\frac{1}{2} \text{ L} = \boxed{4,500} \text{ cm}^3$

3 A rectangular tank measuring 30 cm by 25 cm by 20 cm is $\frac{3}{4}$ filled with water. Some of the water is then poured into a cubical tank with sides of 15 cm to fill it up. What is the volume of the water in liters and milliliters that is left in the rectangular tank?

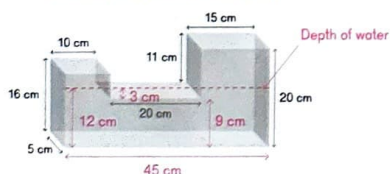


$\frac{3}{4} \times 20 = 15$
 $15 \times 25 \times 30 = 11,250$
 $15 \times 15 \times 15 = 3,375$
 $11,250 - 3,375 = 7,875$
 $7 \text{ L } 875 \text{ mL}$

8-8 Practice B

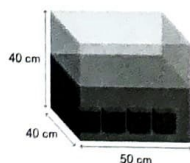
209

4 The container below is filled with water to a depth of 12 cm. What is the volume of water in liters and milliliters?



$(45 \times 5 \times 12) - (20 \times 5 \times 3)$
 $= 2,700 - 300$
 $= 2,400$
 $2,400 \text{ cm}^3$
 $2 \text{ L } 400 \text{ mL}$

5 A rectangular tank measuring 50 cm by 40 cm by 40 cm is half filled with water. When 4 metal cubes each with an edge of 10 cm are placed in the water, the water level rises. What is the new height of the water?



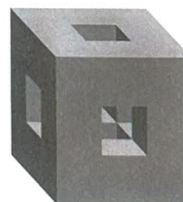
Water level before = 20 cm
 $4 \times 1,000 = 4,000$
 $\frac{4,000}{40 \times 50} = 2$
 $20 + 2 = 22$
 22 cm

210

8-8 Practice B

Challenge

6 A solid cube with an edge 30 cm long has 3 square holes with sides 10 cm long cut all the way through to the other side as shown. What is the volume of the remaining solid?



Subtract volume of each hole and add back in the overlap twice.
 $30 \times 30 \times 30 = 27,000$
 $10 \times 10 \times 30 = 3,000$
 $10 \times 10 \times 10 = 1,000$
 $27,000 - (3 \times 3,000) + (2 \times 1,000) = 20,000$
 $20,000 \text{ cm}^3$

7 A rectangular tank with a base 30 cm by 20 cm is $\frac{1}{2}$ filled with water. After 3 L of water is added to it, it becomes $\frac{3}{5}$ filled with water. What is the height of the water in the tank when it is $\frac{3}{5}$ filled?

$\frac{3}{5} - \frac{1}{2} = \frac{1}{10}$
 $3 \text{ L} \rightarrow \frac{1}{10} \text{ filled}$
 Capacity of tank = 30 L
 $\frac{30,000}{30 \times 20} = 50$
 Height of tank is 50 cm.
 $\frac{3}{5} \times 50 = 30$
 30 cm

8-8 Practice B

211

Exercise 9

Check

- 1 Use the following number to answer the questions: three hundred ninety-four million, eight hundred one thousand.

(a) Write the number in numerals.
394,801,000

(b) What is the value of the digit 9?
90,000,000

(c) Divide the number by 1,000. What is the new value of the digit 9?
90,000

- 2 Find the values. Express fractions in simplest form.

(a) $21 - 14 \div 7 + 3 \times 9$ 46 (b) $8 - 3 \div 4 + 1 \times 2$ $9\frac{1}{4}$

(c) $(2\frac{1}{2} + \frac{2}{3} + 1\frac{5}{6}) \div \frac{1}{5}$ 25 (d) $\frac{1}{2} \times \frac{3}{5} + \frac{1}{4} \div \frac{1}{6}$ $1\frac{4}{5}$

- 3 Ms. Perez earned \$6,942 a month for the past 4 years. How much did she earn in all during those 4 years?

$6,942 \times 4 \times 12 = 333,216$
\$333,216

- 4 The area of a rectangle is 1,568 in². One side measures $2\frac{1}{3}$ feet. What is the length of the other side in inches?

$2\frac{1}{3}$ feet = 28 in
 $1,568 \div 28 = 56$
56 in

- 5 A bottle can hold 3 L of water. It had $2\frac{1}{2}$ L of water at first and then $\frac{3}{4}$ L was poured out. 785 mL was then added. How many more milliliters of water are needed to fill the bottle?

$3 - (2\frac{1}{2} - \frac{3}{4}) = 1\frac{1}{4}$ L
 $1\frac{1}{4} \times 1,000 = 1,250$ mL
 $1,250 - 785 = 465$
465 mL

- 6 Daniel spent $\frac{1}{3}$ of his money on roller blades and $\frac{1}{6}$ of the remainder on a helmet. He had \$155 left. How much money did he have at first?



$$\frac{1}{6} \times \frac{2}{3} = \frac{1}{9}$$

roller blades + helmet = 4 out of 9 units

5 units \rightarrow 155

1 unit $\rightarrow 155 \div 5 = 31$

9 units $\rightarrow 9 \times 31 = 279$

\$279

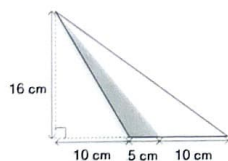
- 7 Some bags of rice have a total weight of 30 kg. Each bag of rice weighs $\frac{3}{5}$ kg. How many bags of rice are there?

$30 \div \frac{3}{5} = 50$
50 bags

- 8 A rectangular city block is twice as long as it is wide. The distance around the block is $\frac{3}{4}$ mile. How wide is the city block?

$\frac{3}{4} \div 6 = \frac{1}{8}$
 $\frac{1}{8}$ mile

- 9 What fraction of the triangle is shaded?



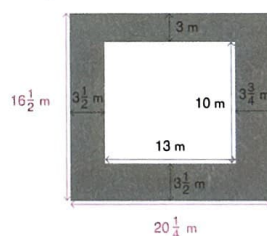
$$\frac{1}{2} \times 15 \times 16 = 120$$

$$\frac{1}{2} \times 5 \times 16 = 40$$

$$\frac{40}{120} = \frac{1}{3}$$

Or: Since the base of the shaded triangle is $\frac{1}{3}$ the base of the entire triangle, and the heights are the same, the area of the shaded part is $\frac{1}{3}$ the area of the entire triangle.

- 10 Find the shaded area in square meters.



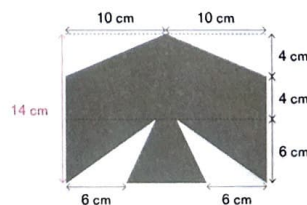
$$16\frac{1}{2} \times 20\frac{1}{4} = 334\frac{1}{8}$$

$$10 \times 13 = 130$$

$$334\frac{1}{8} - 130 = 204\frac{1}{8}$$

$$204\frac{1}{8} \text{ m}^2$$

- 11 Find the area of the following figure.



$$14 \times 20 = 280$$

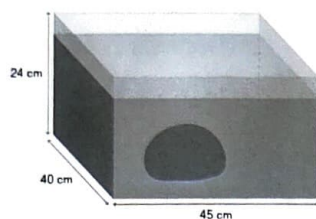
$$2 \times \frac{1}{2} \times 10 \times 4 = 40$$

$$2 \times \frac{1}{2} \times 6 \times 6 = 36$$

$$280 - 40 - 36 = 204$$

$$204 \text{ cm}^2$$

- 12 A rectangular tank measuring 45 cm by 40 cm by 24 cm was $\frac{1}{2}$ filled with water. When a stone was placed in the tank, the tank became $\frac{3}{4}$ filled.



- (a) Find the capacity of the tank in liters and milliliters.

$$45 \times 40 \times 24 = 43,200$$

$$43 \text{ L } 200 \text{ mL}$$

- (b) Find the volume of the stone.

$$\frac{1}{2} \times 24 = 12; \frac{3}{4} \times 24 = 18$$

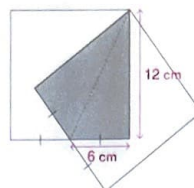
Water rises 6 cm.

$$45 \times 40 \times 6 = 10,800$$

$$10,800 \text{ cm}^3$$

Challenge

- 13 The figure shows two identical squares of sides 12 cm overlapping each other. Find the area of the overlapping part.

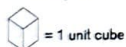


$$2 \times \frac{1}{2} \times 6 \times 12 = 72$$

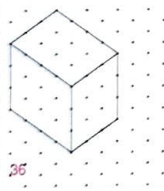
$$72 \text{ cm}^2$$

- 14 A 4-digit multiple of 17 is made up of 4 different digits. What is the least number it could be?
- If a number is a multiple of 17, that number + 17 is a multiple of 17.
- Find the first 4-digit number that is a multiple of 17.
- $$1,000 \div 17 \text{ is } 58 \text{ with a remainder of } 14, \text{ so } 1,003 \text{ is the smallest 4-digit multiple of } 17.$$
- $$1,003 + 17 = 1,020$$
- $$1,020 + 17 = 1,037$$
- 1,037 has 4 different digits, so the answer is 1,037.

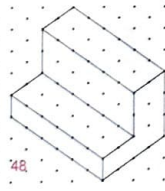
- 15 How many unit cubes are needed to build each of the following solids?



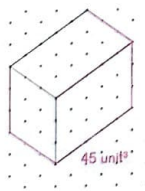
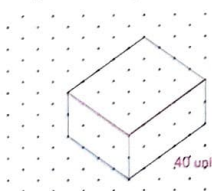
(a)



(b)



- 16 Complete the drawing of each cuboid. Then give the volume in cubic units.



- 17 Draw a solid figure with a volume of 64 cubic units.



Drawings will vary. They do not have to be cuboids.