Chapter 1 Numbers to One Million

Exercise 1

Basics

1

Ten thousands	Thousands	Hundreds	Tens	Ones
8	5	7	9	4

(a) Complete the place-value chart.

(b) Write the number in numerals. 85,794

(c) The value of the digit in the ten thousands place is 80,000.

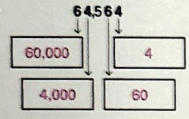
(d) The digit 5 in this number stands for 5 thousands.

(e) Write the number in expanded form. 80,000 + 5,000 + 700 + 90 + 4

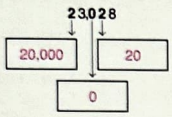
Practice

2 Write the value of each bolded digit.

(a) 64,564



(b) 23,028



(c) In 64,564, the digit 5 stands for 5 hundreds.

(d) In 23,028, the digit 3 is in the thousands place.

3 (a) 87,143 = 80,000 + 7,000 + 100 + 40 + 3

(b) 60,437 = 60,000 + 400 + 30 + 7

(c) 14,092 = 10,000 + 4,000 + 92

(d) 41,404 = 400 + 1,000 + 40,000 + 4

(e) 90,620 = 600 + 90,000 + 20

(f) 30,030 = 30 + 30,000

(g) 62,500 = 500 + 2,000 + 60,000

4 Write the number in numerals.

forty-seven thousand, six hundred ninety-eight	47,698
twenty-three thousand, two hundred four	23,204
thirty-three thousand, thirty-one	33,031
eighteen thousand, forty	18,040
eighty thousand, nine	80,009

5 Write the number in words.

20,640	twenty thousand, six hundred forty
98,700	ninety-eight thousand, seven hundred
55,008	fifty-five thousand, eight
90,077	ninety thousand, seventy-seven
12,120	twelve thousand, one hundred twenty

6 (a) 60,000 = 6 ten thousands

(b) 60,000 = 60 thousands

(c) 60,000 = 600 hundreds

(d) 60,000 = 6,000 tens

(e) 35,000 = 350 hundreds

(f) 10,100 = 1,010 tens

7 Write the number in numerals.

723 hundreds	72,300
9 ten thousands + 24 tens	90,240
800 hundreds + 60 hundreds + 50 tens	86,500
640 tens + 20 thousands	26,400
92 ones + 4,800 tens	48,092

Challenge

8 Use the clues to find the mystery 5-digit number. __7__0__, __8__1__, or __9__2__

Use trial and error with 7, 8, 9 in thousands place. 9 and 8 will cause repeated digits. So it could be __7 8 0 1 or __7 9 0 2.

Clue 1 All the digits are different.

Clue 2 The thousands digit is 7 more than the tens digit.

Clue 3 The hundreds digit is the sum of the thousands digit and the ones digit.

Clue 4 The total of the digits when added together is 24.

7 + 8 + 0 + 1 = 16; 24 − 16 = 8; repeated digit

The number is 67,902. 7 + 9 + 0 + 2 = 18; 24 − 18 = 6

Exercise 2

Basics

1

Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones
6	9	8	3	6	5

(a) Write the number shown in numerals. 698,365

(b) The value of the digit in the hundred thousands place is 600,000.

(c) The digit 3 in this number stands for 3 hundreds.

(d) Write the number in words.

six hundred ninety-eight thousand, three hundred sixty-five

(e) Write the number in expanded form.

600,000 + 90,000 + 8,000 + 300 + 60 + 5

Practice

2 Write the value of each bolded digit.

(a) 3**8**4,802: 300,000 and 80,000; 3**8**4,8**0**2: 0 and 600

(b) 49**4**,4**2**8: 400,000 and 4,000; 49**4**,4**2**8: 400

(c) In 384,802, the digit 4 stands for 4 thousands.

(d) In 494,428, the digit 9 is in the ten thousands place.

3 (a) 625,239 = 600,000 + 20,000 + 5,000 + 200 + 30 + 9

(b) 160,330 = 100,000 + 60,000 + 300 + 30

(c) 604,085 = 600,000 + 4,000 + 80 + 5

(d) 914,053 = 4,000 + 900,000 + 3 + 10,000 + 50

(e) 110,680 = 600 + 10,000 + 100,000 + 80

(f) 720,076 = 6 + 70 + 20,000 + 700,000

(g) 500,200 = 200 + 500,000

4 Write the number in numerals.

four hundred thousand, six hundred ninety-eight	400,698
seven hundred twenty-three thousand, one	723,001
eight hundred thousand, forty	800,040
one hundred thirty thousand, thirty-one	130,031
one million	1,000,000

5 Write the number in words.

271,644	two hundred seventy-one thousand, six hundred forty-four
110,990	one hundred ten thousand, nine hundred ninety
199,009	one hundred ninety-nine thousand, nine
100,007	one hundred thousand, seven

6 (a) 200,000 = 20 ten thousands

(b) 200,000 = 2,000 hundreds

(c) 120,000 = 12,000 tens

(d) 320,000 = 320 thousands

7 Write the number in numerals.

9,860 hundreds	986,000
80 ten thousands + 60 hundreds + 5 tens	806,050
6,175 tens + 200 thousands	261,750
98 tens + 48 ten thousands	480,980
8 ones + 12,000 tens	120,008
ten hundred thousands	1,000,000

Challenge

8 Use the clues to find the mystery 6-digit number.

Answers may vary.

Clue 1 Only two of the digits are the same.

Clue 2 The digit in the tens place is 9 more than the digit in the thousands place. __ __ 0 __ 9 __

Clue 3 The number is an odd number.

Clue 4 The digit in the ones place is 5 more than the digit in the hundred thousands place. 2 __ 0 __ 9 7

Clue 5 The sum of the digits is 34.

2 + 0 + 9 + 7 = 18; 34 − 18 = 16; The other two digits are 8

The number is 280,897.

Exercise 3

Basics

1 Draw more discs or cross off discs to show the number, and fill in the blanks.

1,000 more than 62,584 is 63,584.

100 more than 58,927 is 59,027.

10,000 less than 86,584 is 76,584.

10 less than 26,009 is 25,999.

2 (a) 322,523 + 10,000 = 332,523 (b) 141,523 − 10 = 141,513

(c) 14,690 + 100,000 = 114,690 (d) 81,096 − 100 = 80,996

(e) 100,047 − 100 = 99,947 (f) 179,992 + 10 = 180,002

Practice

3 Follow the rules to create the number patterns.

(a) Count on by ten thousand.

97,376	107,376	117,376	127,376	137,376

(b) Count back by one hundred.

333,333	333,233	333,133	333,033	332,933

(c) Count on by one thousand.

208,997	209,997	210,997	211,997	212,997

4 Complete the number patterns.

68,821	**68,831**	68,841	68,851	68,861	68,871
		68,941			**78,871**
69,039	69,040	69,041	**69,042**		88,871
		69,141			98,871
438,876			141,873		108,871
338,876			**140,873**		**118,871**
238,876			139,873		128,871
138,876	138,875	**138,874**	138,873	138,872	138,871

5 (a) 689,423 is 1,000 more than 688,423.

(b) 111,111 is 10,000 more than 101,111.

(c) 40,989 is 10,000 less than 50,989.

(d) 400,912 is 10,000 more than 390,912.

(e) 98,999 is 1,000 less than 99,999.

(f) 100,099 is 100 more than 99,999.

(g) 1,000,000 is 1 more than 999,999.

6 (a) 24,608 + 100 = 24,708

(b) 7,012 − 100 = 6,912

(c) 1,091 − 10 = 1,081

(d) 8,219 − 100 = 8,119

(e) 8,930 + 100 = 9,030

Challenge

7 Complete the number patterns.

1,000 more and 1 less

(a)	**187,174**	**188,173**	**189,172**	190,171	191,170	192,169
(b)	**51,146**	**62,136**	**73,126**	84,116	95,106	106,096

10,000 more, 1,000 more, 10 less

Exercise 4

Basics

1 Compare the numbers.

Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones
6	3	6	7	9	8
6	3	6	9	2	4

636,924 is greater than 636,798.

Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones
4	9	8	3	6	5
4	2	8	9	0	0

498,365 is greater than 428,900.

Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones
2	8	0	7	8	2
2	8	0	7	4	6

280,746 is less than 280,782.

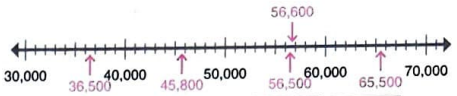
Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones
	9	8	3	6	5
1	7	3	0	0	8

96,365 is less than 173,008.

Practice

2 Locate the numbers on the number line, then write them in order from least to greatest.

45,800 | 56,500 | 65,500 | 36,500 | 56,600



36,500 | 45,800 | 56,500 | 56,600 | 65,500

3 Write > or < in each ◯.

(a) 82,262 (<) 82,623

(b) 918,532 (<) 981,352

(c) 672,365 (<) 672,369

(d) 99,856 (<) 99,865

4 Cross out the numbers that are greater than 55,000 and circle the numbers that are less than 54,600.

45,993 | 54,393 | 7,713 | ~~55,739~~ | ~~315,193~~

5 Write the numbers in order from least to greatest.

792,793 | 797,913 | 983,713 | 792,739 | 797,193

792,739 | 792,793 | 797,193 | 797,913 | 983,713

6 (a) Use the digits 2, 4, 9, 6, 8, and 7 to form the numbers. Use each digit only once for each number.

The greatest 6-digit number.	987,642
The least 6-digit number.	246,789
The least 6-digit even number.	246,798
The greatest 6-digit odd number.	986,427

(b) Write the numbers in order from greatest to least.

987,642 | 986,427 | 246,798 | 246,789

7 Write > or < in each ◯.

(a) 34,009 + 40 (>) 8,000 + 4 + 20,000

(b) 90,000 + 60 + 4,200 (<) 300 + 94,000 + 20

(c) 300 thousands + 70 hundreds (<) 7,000 tens + 30 ten thousands

8 Read the clues. Then circle the correct number.

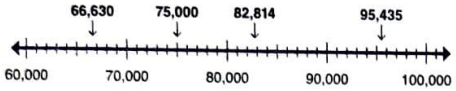
Clue 1 The sum of the digits is more than 20.
Clue 2 There are more than 2,000 tens.
Clue 3 There are less than 450 hundreds.

38,041 | 26,903 | 15,987 | 40,674 | 135,643

Exercise 5

Basics

1 Fill in the blanks.



(a) 66,630 is between 60,000 and 70,000. It is nearer to 70,000 than to 60,000. 66,630 is 70,000 when rounded to the nearest ten thousand.

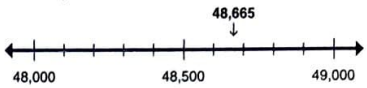
(b) 75,000 is halfway between 70,000 and 80,000. 75,000 is 80,000 when rounded to the nearest ten thousand.

(c) 82,814 is between 80,000 and 90,000. It is nearer to 80,000 than to 90,000. 82,814 is 80,000 when rounded to the nearest ten thousand.

(d) 95,435 is 100,000 when rounded to the nearest ten thousand.

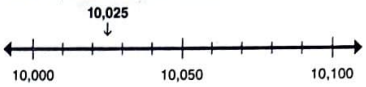
(e) When rounding to the nearest ten thousand, if the digit in the thousands place is 5 or more we round up to the next ten thousand. When it is 4 or less we round down.

2 Round 48,665 to the nearest thousand.



48,665 is 49,000 when rounded to the nearest thousand.

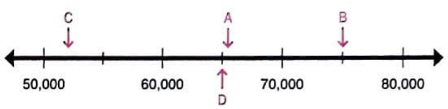
3 Round 10,025 to the nearest hundred.



10,025 is 10,000 when rounded to the nearest hundred.

Practice

4 Indicate the location or approximate location of each number on the number line. Then round each number to the nearest ten thousand.



A 65,501 | 70,000 | B 75,000 | 80,000

C 51,980 | 50,000 | D 64,999 | 60,000

5 Jupiter has a diameter of 88,846 miles at its equator. Round this number to the nearest ten thousand. 90,000

6 Round each number to the nearest ten thousand.

(a) 10,920 | 10,000 | (b) 16,501 | 20,000

(c) 24,499 | 20,000 | (d) 97,522 | 100,000

7 The table shows the maximum depth of some ocean trenches in feet. Complete the table.

Trench	Depth (ft)	Depth to the nearest		
		10,000 ft	1,000 ft	100 ft
Peru-Chile Trench	26,460	30,000	26,000	26,500
Kermadec Trench	32,962	30,000	33,000	33,000
Japan Trench	34,039	30,000	34,000	34,000
Tonga Trench	35,702	40,000	36,000	35,700
Mariana Trench	36,070	40,000	36,000	36,100

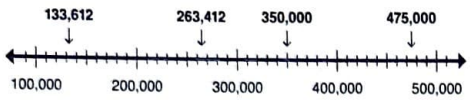
8 (a) What is the least whole number that rounds to 230,000 when rounded to the nearest ten thousand? 225,000

(b) What is the greatest whole number that rounds to 230,000 when rounded to the nearest ten thousand? 234,999

Exercise 6

Basics

1. Fill in the blanks.



(a) 133,612 is between 100,000 and 200,000. It is nearer to 100,000 than to 200,000. 133,612 is 100,000 when rounded to the nearest ___hundred thousand___.

(b) 263,412 is between 200,000 and 300,000. It is nearer to 300,000 than to 200,000. 263,412 is ___300,000___ when rounded to the nearest hundred thousand.

(c) 350,000 is halfway between ___300,000___ and 400,000. 350,000 is ___400,000___ when rounded to the nearest hundred thousand.

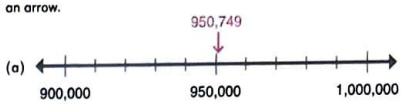
(d) 475,000 is ___500,000___ when rounded to the nearest hundred thousand.

(e) When rounding to the nearest hundred thousand, if the digit in the ___ten thousands___ place is ___5___ or more we round up to the next hundred thousand. When it is ___4___ or less we round down.

Practice

2. Indicate the approximate location of 950,749 on each number line with an arrow.

(a)

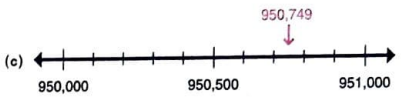


950,749 is ___1,000,000___ when rounded to the nearest hundred thousand.

(b)

950,749 is ___950,000___ when rounded to the nearest ten thousand.

(c)



950,749 is ___951,000___ when rounded to the nearest thousand.

(d)

950,749 is ___950,700___ when rounded to the nearest hundred.

3. Round each number to the nearest hundred thousand.

(a) 109,920 | 100,000 |

(b) 639,501 | 600,000 |

(c) 250,000 | 300,000 |

(d) 97,522 | 100,000 |

4. The diameter of Jupiter at the equator is 142,984 km. Round this number to:

(a) the nearest hundred thousand. | 100,000 |

(b) the nearest ten thousand. | 140,000 |

(c) the nearest thousand. | 143,000 |

(d) the nearest hundred. | 143,000 |

Challenge

5. A number, when rounded to the nearest thousand, ten thousand, or hundred thousand is 500,000. What is the least whole number it could be?

499,500

6. A number, when rounded first to the nearest thousand, then the nearest ten thousand, then the nearest hundred thousand, is 500,000. What is the least whole number it could be?

444,500

Exercise 7

Basics

1 Add.

(a) 8 thousands + 6 thousands = [14] thousands

8,000 + 6,000 = [14,000]

(b) 35 thousands + 9 thousands = [44] thousands

35,000 + 9,000 = [44,000]

(c) 14 ten thousands + 23 ten thousands = [37] ten thousands

140,000 + 230,000 = [370,000]

2 Subtract.

(a) 8 ten thousands − 6 ten thousands = [2] ten thousands

80,000 − 60,000 = [20,000]

(b) 12 thousands − 7 thousands = [5] thousands

12,000 − 7,000 = [5,000]

(c) 89 hundreds − 24 hundreds = [65] hundreds

8,900 − 2,400 = [6,500]

3 Multiply.

(a) 8 thousands × 6 = [48] thousands

8,000 × 6 = [48,000]

(b) 4 hundreds × 5 = [20] hundreds

400 × 5 = [2,000]

(c) 15 ten thousands × 3 = [45] ten thousands

150,000 × 3 = [450,000]

4 Divide.

(a) 8 hundred thousands ÷ 2 = [4] hundred thousands

800,000 ÷ 2 = [400,000]

(b) 72 thousands ÷ 6 = [12] thousands

72,000 ÷ 6 = [12,000]

(c) 40 hundreds ÷ 8 = [5] hundreds

4,000 ÷ 8 = [500]

(d) 15 ten thousands ÷ 5 = [3] ten thousands

150,000 ÷ 5 = [30,000]

Practice

5 (a) 7,800 + 500 = [8,300]

(b) 31,000 − 7,000 = [24,000]

(c) 700,000 × 5 = [3,500,000]

(d) 360,000 ÷ 6 = [60,000]

(e) 5,000 × 6 = [30,000]

(f) 82,000 − 60,000 = [22,000]

(g) 100,000 ÷ 5 = [20,000]

(h) 42,000 + 90,000 = [132,000]

(i) 120,000 × 2 = [240,000]

(j) 4,000 − 900 = [3,100]

(k) 50,000 ÷ 2 = [25,000]

(l) 120,000 + 71,000 = [191,000]

(m) [30,000] × 9 = 270,000

(n) 5,600 ÷ [8] = 700

(o) [75,000] − 60,000= 15,000

(p) 620,000 − [400,000] = 220,000

Exercise 8

Check

1 (a) In 714,564, the digit 5 stands for 5 ___hundreds___.

(b) In the number for four hundred twenty-three thousand, sixty-seven, the value of the digit in the ten thousands place is ___20,000___.

2 (a) Write the numbers in numerals.

90,000 + 5,000 + 50 + 2	95,052
94 ten thousands + 80 hundreds + 70 tens	948,700
9 ten thousands + 7 thousands + 4 hundreds	97,400
The greatest 6-digit even number with 4 in the ten thousands place and all digits different.	948,762
The least 6-digit odd number with 9 in the hundred thousands place and 4 in the thousands place.	904,001

(b) Write the numbers above in order from greatest to least.

948,762 | 948,700 | 904,001 | 97,400 | 95,052

3 Continue the number patterns.

(a) **79,325** | **79,225** | 79,125 | 79,025 | 78,925

(b) **97,167** | **98,167** | 99,167 | 100,167 | 101,167

(c) **248,642** | **248,742** | 248,842 | 248,942 | 249,042

4 The diameter of Neptune at the equator is 49,532 km. Round this number to:

(a) the nearest ten thousand. 50,000

(b) the nearest thousand. 50,000

(c) the nearest hundred. 49,500

5 The diameter of Saturn at the equator is 120,536 km. Round this number to:

(a) the nearest hundred thousand. 100,000

(b) the nearest ten thousand. 120,000

(c) the nearest thousand. 121,000

6 Write >, <, or = in each ◯.

(a) 89,000 − 100 (>) 9,000 × 9

(b) 3,400 + 800 (<) 5 × 4,000

(c) 48,000 ÷ 8 (<) 24,000 + 5,000

(d) 230,000 − 80,000 (>) 62,000 + 37,000 + 8,000 + 13,000

7 A house costs 6 times as much as a car. The car costs $40,000. How much does the house cost?

40,000 × 6 = 240,000

$240,000

8 A number is 32,000 less than the quotient of 560,000 ÷ 7. What is the number?

560,000 ÷ 7 = 80,000

80,000 − 32,000 = 48,000

48,000

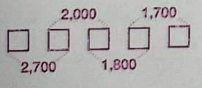
9 A number is rounded to 400,000 when rounded to the nearest ten thousand. What is the least possible and what is the greatest possible whole number it could be?

Least possible: 395,000

Greatest possible: 404,999

Challenge

10 There are 5,000 nails in five boxes. The first and second boxes have 2,700 nails altogether. The second and third boxes have 2,000 nails altogether. The third and fourth boxes have 1,800 nails altogether. The fourth and fifth boxes have 1,700 nails altogether. How many nails are in each box?



1st: 5,000 − 2,000 − 1,700 = 1,300

2nd: 2,700 − 1,300 = 1,400

3rd: 2,000 − 1,400 = 600

4th: 1,800 − 600 = 1,200

5th: 1,700 − 1,200 = 500

Check: 1,300 + 1,400 + 600 + 1,200 + 500 = 5,000

11 Four blocks, red, blue, green, and yellow, are in a row. The red block is to the right of the blue block, but not directly beside the blue block. The green block is not next to the blue block. The yellow block is next to the red block. What is the order of the blocks from left to right?

blue, yellow, red, green

Chapter 2 Addition and Subtraction

Exercise 1

Basics

1 (a) Estimate the sum of 85,459 and 8,586 two different ways as shown.

85,459 + 8,586
↓ ↓
90,000 + 10,000 = 100,000

85,459 + 8,586
↓ ↓
85,000 + 9,000 = 94,000

(b) Which estimate will be closer to the actual sum?
94,000

(c) Which estimate was easier to calculate mentally?
100,000

(d) Find the sum of 85,459 and 8,586.

	8	5,	4	5	9
+		8,	5	8	6
	9	4,	0	4	5

2 Estimate and then find the sum of 58,965 and 62,432.
Estimates may vary.

58,965 + 62,432
↓ ↓
[ ] + [ ] = [ ]

	5	8,	9	6	5
+	6	2,	4	3	2
1	2	1,	3	9	7

Practice

3 (a) Estimate the sum of 462,754 and 63,689 two different ways as shown.

462,754 + 63,689
↓ ↓
500,000 + 60,000 = 560,000

462,754 + 63,689
↓ ↓
460,000 + 60,000 = 520,000

(b) Find the sum of 462,754 and 63,689.

	4	6	2,	7	5	4
+		6	3,	6	8	9
	5	2	6,	4	4	3

4 Estimate and then find the sum of 34,842 + 5,783 + 7,874.
Estimates may vary.

34,842 + 5,783 + 7,874
↓ ↓ ↓
[ ] + [ ] + [ ] = [ ]

	3	4,	8	4	2
		5,	7	8	3
+		7,	8	7	4
	4	8,	4	9	9

5 How many digits are in the sum of 73,921 and 82,692?
Estimate: Adding the 7 and 8 in the ten thousands place gives a 2-digit sum, so there will be one more digit in the sum.

6 digits

6 Circle the number that is equal to 5,968 + 58,934 + 4,982 without calculating the exact answer.

75,904	14,984	69,884	158,644

7 Estimate and then find the sum. Estimates may vary.

(a) 25,863 + 97,672 ≈ [ ]

25,863 + 97,672 = 123,535

(b) 186,485 + 41,264 + 786 ≈ [ ]

186,485 + 41,264 + 786 = 228,535

Challenge

8 In the following problem, the letters D, E, and Y stand for different digits. What is the number DYE?

	1	1	1
	E	D	D	Y
+		Y	Y	Y
	D	E	E	D

DYE = 685

There is regrouping from the hundreds place to the thousands place, so E + 1 = D. The sum in the hundreds and tens place is the same, so there is regrouping to the hundreds place as well: D + Y + 1 = 1E. Similarly, Y + Y = 1D. D must be even, and cannot be 0, so must be 2, 4, 6 or 8. Use trial and error for Y = 6, 7, 8 and 9. Only 8 works. Students may also simply start with trial and error where D is even and not 0.

↖ even, not 0

	5	6	6	8
+		8	8	8
	6	5	5	6

Exercise 2

Basics

1 (a) Estimate the difference between 62,342 and 8,724 two different ways as shown.

62,342 − 8,724
↓ ↓
60,000 − 9,000 = 51,000

62,342 − 8,724
↓ ↓
62,000 − 9,000 = 53,000

(b) Which estimate will be closer to the actual difference?
53,000

(c) Which estimate was easier to calculate mentally?
51,000

(d) Find the difference between 62,342 and 8,724.

	6	2,	3	4	2
−		8,	7	2	4
	5	3,	6	1	8

2 Estimate and then find the difference between 51,582 and 38,958.
Estimates may vary.

51,582 − 38,958
↓ ↓
[ ] − [ ] = [ ]

	5	1,	5	8	2
−	3	8,	9	5	8
	1	2,	6	2	4

Practice

3 (a) Estimate the difference between 852,065 and 57,393 two different ways as shown.

852,065 − 57,393
↓ ↓
900,000 − 60,000 = 840,000

852,065 − 57,393
↓ ↓
850,000 − 50,000 = 800,000

(b) Find the difference between 852,065 and 57,393.

	8	5	2,	0	6	5
−		5	7,	3	9	3
	7	9	4,	6	7	2

4 Estimate and then find the difference between 35,974 and 75,506.
Estimates may vary.

75,506 − 35,974
↓ ↓
[ ] − [ ] = [ ]

		7	5,	5	0	6
−		3	5,	9	7	4
		3	9,	5	3	2

5 Is 624,987 − 78,965 closer to 540,000 or 500,000?
540,000

6 How many digits are in the value of 150,747 − 83,965?
5 digits

7 Circle the number that is equal to 214,094 − 78,934 − 42,762 without calculating the exact answer.

80,218 | **92,398** | 92,001 | 106,498

8 Estimate and then find the difference.
Estimates may vary.

(a) 80,703 − 72,389 ≈ [ ]

80,703 − 72,389 = 8,314

−					

(b) 416,415 − 41,267 ≈ [ ]

416,415 − 41,267 = 375,148

−					

Challenge

9 In the following problem, the letters A, B, C, D, and E stand for different digits. Find two possible values for ABCDE.

	A	B	A	A	B
−			C	B	C
	D	C	E	D	1

Since AB changes to DC after subtraction, B must be 0 and C must be 9. Try 2, 3, etc. for A. Two possible solutions are:

	2	0	2	2	0
−			9	0	9
	1	9	3	1	1

ABCDE = 20,913

	3	0	3	3	0
−			9	0	9
	2	9	4	2	1

ABCDE = 30,924

Exercise 3

Basics

1 (a) 100 = 9 tens + [10] ones

(b) 1,000 = 9 hundreds + [10] tens

= 9 hundreds + 9 tens + [10] ones

(c) 10,000 = 9 thousands + [10] hundreds

= 9 thousands + [9] hundreds + 10 tens

= 9 thousands + 9 hundreds + [9] tens + 10 ones

2

9,000 = 5,000 + [4,000]	3,000 + [6,000] = 9,000
900 = 300 + [600]	600 + [300] = 900
90 = 70 + [20]	0 + [90] = 90
10 = 8 + [2]	2 + [8] = 10
10,000 = 5,378 + [4,622]	3,602 + [6,398] = 10,000
4,000 + [5,000] = 9,000	0 + [9,000] = 9,000
900 + [0] = 900	700 + [200] = 900
10 + [90] = 100	60 + [40] = 100
4,910 + [5,090] = 10,000	760 + [9,240] = 10,000

Practice

3

10,000 − 4,321 = [5,679]	1,000 − 844 = [156]
60,000 − 4,321 = [55,679] (50,000, 10,000)	72,000 − 844 = [71,156] (71,000, 1,000)
100 − 82 = [18]	100 − 55 = [45]
2,400 − 82 = [2,318] (2,300, 100)	89,600 − 55 = [89,545] (89,500, 100)
70,000 − 7,096 = [62,904] ([60,000], 10,000)	23,000 − 191 = [22,809] ([22,000], 1,000)

4 (a) 4,930 + [5,070] = 10,000

(b) [9,279] + 721 = 10,000

(c) 42 + [9,958] = 10,000

(d) 7,008 + [22,992] = 30,000

5 (a) 10,000 − 8,444 = [1,556]

(b) 40,000 − 6,009 = [33,991]

(c) 80,000 − 772 = [79,228]

(d) 20,000 − 66 = [19,934]

6 (a) 41,000 − 430 = [40,570]

(b) 87,500 − 82 = [87,418]

(c) 24,000 − [23,690] = 310

(d) 92,400 − [92,356] = 44

7 A bin had 10,000 nails. 5,346 were used, then another 715 were used. How many nails are left in the bin?

Nails used: 5,346 + 715 = 6,061

Nails left: 10,000 − 6,061 = 3,939

3,939 nails

8 A club raised $20,000 in a fundraiser. They spent $13,750 of it so far. How much money do they still have?

20,000 − 13,750 = 6,250

$6,250

Challenge

9 (a) 100,000 − 94,321 = [5,679]

(b) 500,000 − 20,570 = [479,430]

(c) 789,000 − 6,008 = [782,992]

(d) 1,000,000 − 433,860 = [566,140]

Exercise 4 • pages 34–37

Exercise 4

Basics

1. 5,784 + 998 = 5,782 + 1,000 = 6,782
   (5,782, 2)

   5,784 —(−2)→ 5,782 —(+1,000)→ 6,782

   5,784 —(+1,000)→ 6,784 —(−2)→ 6,782

2. 5,784 − 998 = 4,784 + 2 = 4,786
   (4,784, 1,000)

   5,784 —(+2)→ 5,786 —(−1,000)→ 4,786

   5,784 —(−1,000)→ 4,784 —(+2)→ 4,786

3.

4,327 + 99 = 4,426 (4,326, 1)	4,327 − 99 = 4,228 (4,227, 100)
4,327 + 299 = 4,626 (4,326, 1)	4,327 − 299 = 4,028 (4,027, 300)
4,327 + 1,999 = 6,326 (4,326, 1)	4,327 − 1,999 = 2,328 (2,327, 2,000)

4. (a) 50 + 60 = 110
   (b) 450 + 60 = 510
   (c) 7,450 + 60 = 7,510
   (d) 7,458 —(+60)→ 7,518 —(−1)→ 7,517
   (e) 7,458 + 59 = 7,457 + 60 = 7,517
   (7,457, 1)

5. (a) 21 − 4 = 17
   (b) 210 − 40 = 170
   (c) 3,210 − 40 = 3,170
   (d) 3,218 —(−40)→ 3,178 —(+2)→ 3,180
   (e) 3,218 − 38 = 3,178 + 2 = 3,180
   (3,178, 40)

6. (a) 4,387 —(+40)→ 4,427 —(−1)→ 4,426
   4,387 + 39 = 4,426
   (b) 6,228 —(−40)→ 6,188 —(+1)→ 6,189
   6,228 − 39 = 6,189

Practice

7. Add or subtract.

8,432 + 99 8,531 C	9,007 − 98 8,909 H	10,000 − 8,492 1,508 T
3,889 + 998 4,887 M	9,868 − 999 8,869 V	6,129 + 498 6,627 R
984 + 799 1,783 S	4,725 + 89 4,814 G	10,000 − 398 9,602 N
9,000 − 998 8,002 I	10,000 − 28 9,972 K	7,407 + 1,998 9,405 O
9,921 − 2,999 6,922 E	987 + 78 1,065 P	10,000 − 3,702 6,298 A

Write the letters that match the answers and learn a fun fact.

S	H	A	R	K	S		C	A	N
1,783	8,909	6,298	6,627	9,972	1,783	1,873	8,531	6,298	9,602

N	E	V	E	R		S	T	O	P
9,602	6,922	8,869	6,922	6,627	8,431	1,783	1,508	9,405	1,065

		M	O	V	I	N	G		
8,969	1,873	4,887	9,405	8,869	8,002	9,602	4,814	8,431	8,969

Challenge

8.

5,400 + 800 = 6,200	4,200 − 600 = 3,600
57 + 7 = 64	81 − 5 = 76
5,457+ 807 = 6,264	4,281− 605 = 3,676
25,000 + 8,000 = 33,000	46,000 − 9,000 = 37,000
213 + 8 = 221	775 − 8 = 767
25,213 + 8,008 = 33,221	46,775 − 9,008 = 37,767

9. (a) 3,864 + 606 = 4,470
   (b) 9,472 − 508 = 8,964
   (c) 72,509 + 6,005 = 78,514
   (d) 13,381 − 4,007 = 9,374

10. 399 + 498 + 597 + 696 = 2,190

    400 + 500 + 600 + 700
    − 1 − 2 − 3 − 4

11. 30,022 + 29,998 + 29,980 + 30,010 = 120,010

    30,000 + 30,000 + 30,000 + 30,000
    + 22 − 2 − 20 + 10

Exercise 5

Basics

1 For each problem, finish labeling the bar model with the information given in the problems. Mark the quantity that needs to be found with a question mark. Then solve the problem.

(a) There are 3 laptops for sale at a store. Laptop A costs $1,200 and is $900 less than Laptop B. Laptop C costs $285 more than Laptop B. How much do all three laptops cost altogether?

Laptop B: 1,200 + 900 = 2,100
Laptop C: 2,100 + 285 = 2,385
All three: 1,200 + 2,100 + 2,385 = 5,685
$5,685

or: 1,200 × 3 = 3,600
900 × 2 = 1,800
3,600 + 1,800 + 285 = 5,685

(b) A bookstore sold 435 fewer books on Saturday than on Friday. On Sunday, it sold 3,260 books, which was 1,420 more books than on Friday. How many books did it sell altogether during the three days?

Friday: 3,260 − 1,420 = 1,840
Saturday: 1,840 − 435 = 1,405
All three: 3,260 + 1,840 + 1,405 = 6,505
6,505 books

(c) There were 8,435 more kilograms of beans in Bin A than in Bin B in a warehouse. After 2,630 kilograms of beans were taken out of Bin A, 11,550 kilograms of beans were left in Bin A. How many kilograms of beans were in Bin B?

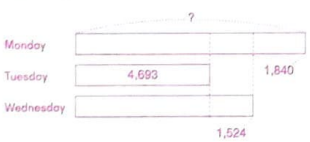
Bin A (before): 11,550 + 2,630 = 14,180
Bin B: 14,180 − 8,435 = 5,745
5,745 kg

(d) There were 456 fewer students in School A than in School B. After 162 students transferred from School B to School A, how many more students were in School B than School A?

456 − 162 − 162 = 132
132 more students

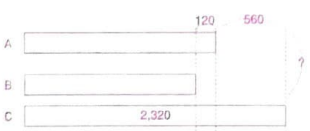
Practice

2 4,693 concert tickets were sold on Tuesday. 1,840 more concert tickets were sold on Monday than on Wednesday. 1,524 fewer concert tickets were sold on Tuesday than on Wednesday. How many concert tickets were sold on Monday?



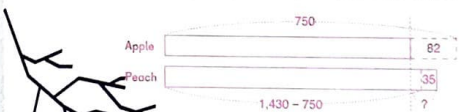
Wednesday: 4,693 + 1,524 = 6,217
Monday: 6,217 + 1,840 = 8,057
8,057 concert tickets

3 String A is 560 cm shorter than String C and 120 cm longer than String B. String C is 2,320 cm long. How long are Strings A and B together?



String A: 2,320 − 560 = 1,760
String B: 1,760 − 120 = 1,640
1,760 + 1,640 = 3,400
3,400 cm

4 There were 1,430 trees in an orchard. 750 of them were apple trees and the rest were peach trees. After 82 of the apples trees died, and 35 more peach trees were planted, how many more peach trees than apple trees were there?



Apple trees (after): 750 − 82 = 668
Peach trees (before): 1,430 − 750 = 680
Peach trees (after): 680 + 35 = 715
715 − 668 = 47
47 more peach trees

5 There were 1,350 cars in Lot A. After 420 cars were moved from Lot B to Lot A, there were 1,720 cars in Lot B. How many cars are in both lots altogether?

Lot A: 1,350 + 420 = 1,770
Both lots: 1,770 + 1,720 = 3,490
3,490 cars

Exercise 6 • pages 42–46

Exercise 6

Check

1. Estimate and then find the values. Estimates may vary.

(a) 45,846 + 32,185 ≈ ☐

45,846 + 32,185 = 78,031

(b) 345,000 − 83,723 ≈ ☐

345,000 − 83,723 = 261,277

(c) 62,089 + 490,076 ≈ ☐

62,089 + 490,076 = 552,165

(d) 87,002 − 49,725 ≈ ☐

87,002 − 49,725 = 37,277

2. (a) 4,892 + 99 = 4,991 (b) 10,000 − 985 = 9,015

(c) 70,000 − 4,568 = 65,432 (d) 892 + 498 = 1,390

(e) 7,718 + 89 = 7,807 (f) 6,500 − 87 = 6,413

(g) 82,780 − 998 = 81,782 (h) 84,345 + 142 = 84,487

3. There were 5,878 passengers on a ship. At the end of a week-long cruise, 4,341 people got off, and the rest stayed on for the next week. 4,362 more people got on for the next week.

(a) Estimate how many people are now on the ship.
Estimates will vary.

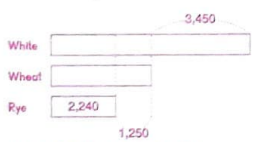
(b) Find how many people are now on the ship.
5,878 − 4,341 = 1,537
1,537 + 4,362 = 5,899
5,899 people

(c) The capacity of the ship is 6,000 passengers. By how much is the ship under capacity for the second week?
6,000 − 5,899 = 101
101 people

4. On a cruise ship, 479,314 gallons of fresh water were consumed in one day. 13,174 of those gallons were frozen for ice. How many gallons of water were not used for ice?
479,314 − 13,174 = 466,140
466,140 gallons

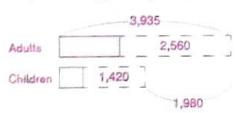
5. A cruise ship needs to have at least 40,000 pounds of potatoes for a two-week cruise. It has 2,786 pounds left over from the last trip. It can order potatoes from a supplier in amounts rounded to the nearest thousand pounds. How many pounds of potatoes must it order?
40,000 − 2,786 = 37,214
38,000 pounds

6. For a one-week cruise, a cruise ship had 3,450 more pounds of white flour than whole wheat flour and 1,250 pounds less rye flour than whole wheat flour. It had 2,240 pounds of rye flour. How many pounds of the three types of flour did it have altogether?



Wheat: 2,240 + 1,250 = 3,490
White: 3,490 + 3,450 = 6,940
All three: 6,940 + 3,490 + 2,240 = 12,670
12,670 pounds

7. On a cruise, there were 3,935 adults. There were 1,980 fewer children than adults. After 2,560 adults and 1,420 children got off the ship for the day at one stop, how many passengers were left on the ship?

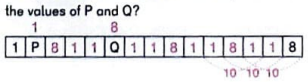


Adults (after): 3,935 − 2,560 = 1,375
Children (before): 3,935 − 1,980 = 1,955
Children (after): 1,955 − 1,420 = 535
Passengers (after): 1,375 + 535 = 1,910
1,910 passengers

Challenge

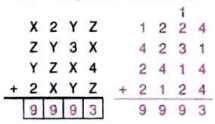
8. There are 1,000 flags in a row. From left to right, the 60th to 290th flags are blue. From right to left, the 150th to 410th flags are blue. The rest of the flags are red. How many red flags are there?
60th to 290th flags: 290 − 60 + 1 = 231
150th to 410th flags: 410 − 150 + 1 = 261
Blue flags: 231 + 261 = 492
Red flags: 1,000 − 492 = 508
508 red flags

9. 15 digits are in a row. The sum of every 3 consecutive digits is 10. What are the values of P and Q?



Start with the 8. The two numbers to the left of 8 could be 1 and 1 or 0 and 2. The pattern repeats, since every 3 consecutive digits must have a sum of 10. Q must be 8 as well as the digit after P. If the first digit is 1, the two digits to the left of 8 must be 1 and 1, and P must therefore be 1.
P = 1, Q = 8

10. In the following problem, the letters X, Y, and Z stand for different digits. What is the greatest possible sum?



X = 1
Y = 2
Z = 4

The greatest sum would have as many digits 9 as possible, starting from the left. In the thousands place, if X + Y + Z + 2 = 9, then X + Y + Z = 7. The same would be true for the hundreds place. The only possibilities for X, Y, and Z are 1, 2, and 4, and there is no regrouping from the tens place. Use trial and error for X, Y, or Z being 1, 2, or 4 in the ones and tens place. The greatest possible sum is 9,993.

11 **Step 1** Pick any 4-digit number where the thousands digit and hundreds digit are different.

Step 2 Reverse its digits.

Step 3 Find the difference between these two numbers.

Step 4 Reverse its digits.

Step 5 Find the sum of the difference and its reverse.

Example

4,632

↓

2,364

↓

4,632 − 2,364 = 2,268

↓

8,622

↓

2,268 + 8,622 = 10,890

Do these 5 steps with other numbers. What do you observe?

The final number is always either 10,890 or 9,999.

12 **Step 1** Use any three different digits to make the greatest and least 3-digit number.

Step 2 Find the difference between them.

Step 3 Continually repeat steps 1 and 2 using the digits from this new number.

What happens?

Example

743 and 347

↓

743 − 347 = 396

↓

963 − 369 = 594

954 − 459 = 495

954 − 459 = 495

You eventually get 495 again and again.

Try some other numbers. Does the same thing happen?

Yes.

Chapter 3 Multiples and Factors

Exercise 1

Basics

1 (a) Find the first ten multiples of 7.

7, 14, 21, 28, 35, 42, 49, 56, 63, 70

(b) What is the 13th multiple of 7?
91

(c) What is the 7th multiple of 20?
140

(d) Is 105 a multiple of 7?
Yes, 105 ÷ 7 is 15 with no remainder.

2 Without dividing, how can you easily determine if a number is...

(a) a multiple of 2?
The ones digit is 0, 2, 4, 6, or 8.

(b) a multiple of 3?
The sum of the digits is a multiple of 3.

(c) a multiple of 5?
The ones digit is 0 or 5.

3 Is 105 a multiple of 2, 3, or 5?
105 is a multiple of 3 and 5, but not 2.

Practice

4 (a) List the first twelve multiples of 5.
5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60

(b) List the first four multiples of 17.
17, 34, 51, 68

5 Circle the numbers that are multiples of 6.

6	16	34	54	56	88	96

6 Circle the numbers that are multiples of 8.

6	16	34	54	56	88	96

7 (a) What is the 12th multiple of 9?
108

(b) What is the 11th multiple of 10?
110

(c) Is 110 a multiple of 4?
No. 110 ÷ 4 is 27 R 2.

(d) Is 136 a multiple of 4?
Yes. 136 ÷ 4 is 34 with no remainder.

8

15	36	60	64	78	120	216

Which of the above numbers are multiples of:

(a) 2?
36, 60, 64, 78, 120, 216

(b) 9?
36, 216

(c) 3?
15, 36, 60, 78, 120, 216

(d) 6?
36, 60, 78, 120, 216

(e) 5?
15, 60, 120

(f) 10?
60, 120

Challenge

9 A certain number is a multiple of 8. When 4 is added to it, the sum is the 4th multiple of 13. What is the number?
4th multiple of 13 = 52
52 − 4 = 48
48

10 In the pattern below, what shape will be in the 32nd position?

■ ▲ ● ■ ▲ ● ■ ▲ ● ■ ▲ ●

The pattern repeats every 3 shapes. 32 ÷ 3 is 10 with a remainder of 2. The second shape is a triangle, so the 32nd shape is a triangle.

Exercise 2

Basics

1. List the first twelve multiples of each number. Then list the common multiples.

(a) Multiples of 3:
3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, 36
Multiples of 4:
4, 8, 12, 16, 20, 24, 28, 32, 36, 40, 44, 48
First three common multiples of 3 and 4:
12, 24, 36

(b) Multiples of 6:
6, 12, 18, 24, 30, 36, 42, 48, 54, 60, 66, 72
Multiples of 9:
9, 18, 27, 36, 45, 54, 63, 72, 81, 90, 99, 108
First three common multiples of 6 and 9:
18, 36, 54

2. List the first eight multiples of 8.
8, 16, 24, 32, 40, 48, 56, 64
Which of these are also multiples of 6?
24, 48
What are the first two common multiples of 6 and 8?
24, 48

3. 21 is a common multiple of __3__ and __7__.

Is 42 also a common multiple of those two numbers?
Yes
Give the next two common multiples of those two numbers.
Multiples of 21 are common multiples of 3 and 7.
21 × 3 = 63, 21 × 4 = 84
63, 84

Practice

4. Find the first two common multiples of 8 and 12.
Multiples of 12: 12, 24, 36, 48
24 and 48 are also multiples of 8.
Common multiples: 24, 48

5. Circle the numbers that are common multiples of 3 and 4.

4	12	28	32	48	72

6. Find the first three common multiples of 2, 3, and 4.
Multiples of 4: 4, 8, 12, 16, 20, 24, 28, 32, 36
All multiples of 4 are multiples of 2.
12, 24, and 36 are also multiples of 3.
Common multiples: 12, 24, 36

7. Find the first three common multiples of 3, 5, and 6.
Multiples of 6: 6, 12, 18, 24, 30, ...
All multiples of 6 are multiples of 3.
30 is the first common multiple of 6 and 5, so the next two are 60 and 90
Common multiples: 30, 60, 90

8. Three numbers have a common multiple of 24. What is another common multiple of those three numbers?
Any multiple of 24 is a common multiple of the three numbers.
Example: 48

9. There are between 50 and 100 blocks. The blocks can be stacked equally into either 7 stacks or 5 stacks. How many blocks are there?
Multiples of 5: Any number that ends in 5 or 0.
The first common multiple of 5 and 7 is 35. The next ones will be 70 and 105. 70 is between 50 and 100.
There are 70 blocks.

10. 3 bells ring at intervals of 3, 6, and 8 minutes. If they all rang together at 3:00, what time will they ring together again?
Multiples of 8: 8, 16, 24
24 is the first one that is a multiple of 6.
All multiples of 6 are multiples of 3.
24 minutes after 3:00 is 3:24.
3:24

Challenge

11. A number, when divided by 5 gives a remainder of 3, and when divided by 4 gives a remainder of 1. What is the least number it could be?
Multiples of 5, added to 3: 8, 13, 18, 23, 28, 33
Multiples of 4, added to 1: 5, 9, 13, 17, 21, 25, 29, 33
13

12. A number, X, is a common multiple of 2, 6, and 8. Another number, Y, is a common multiple of 3, 5, and 10. What is the least possible value for X + Y?
Multiples of 8: 8, 16, 24
24 is also a multiple of 6 and 2.
Multiples of 10: 10, 20, 30
30 is also a multiple of 3 and 5.
24 + 30 = 54

Exercise 3

Basics

1. Find the factors of 16.

16 = 1 × 16

16 = 2 × 8 16 = 4 × 4

The factors of 16 are 1, 2, 4, 8, and 16.

2. (a) Find the factors of 35.

35 = 1 × 35 35 = 5 × 7 35 = 7 × 5

The factors of 35 are 1, 5, 7, and 35.

(b) How can we tell without dividing that 2, 4, and 6 are not factors of 35?
2, 4, and 6 are all even numbers and 35 is odd.

3. (a) $8\overline{)94}$ = 11 R 6

Is 8 a factor of 94? No

(b) $8\overline{)96}$ = 12

Is 8 a factor of 96? Yes

Practice

4. Write "yes" or "no."

Number	Is 2 a factor?	Is 3 a factor?	Is 5 a factor?
5	No	No	Yes
15	No	Yes	Yes
36	Yes	Yes	No
60	Yes	Yes	Yes
73	No	No	No
84	Yes	Yes	No
100	Yes	No	Yes
114	Yes	Yes	No
120	Yes	Yes	Yes

5. (a) Circle the numbers that are factors of 18.

1 **2** **3** 4 5 **6** 7

(b) Circle the numbers that are factors of 48.

3 5 **6** **8** 10 **48** **96**

(c) Circle the numbers that have 6 as a factor.

1 3 **6** 26 **30** **72** **100**

6. Find all the factors of each of the following numbers. List them in order from least to greatest.

(a) 56
1, 2, 4, 7, 8, 14, 28, 56

(b) 64
1, 2, 4, 8, 16, 32, 64

(c) 80
1, 2, 4, 5, 8, 10, 16, 20, 40, 80

(d) 96
1, 2, 3, 4, 6, 8, 12, 16, 24, 32, 48, 96

(e) 120
1, 2, 3, 4, 5, 6, 8, 10, 12, 15, 20, 24, 30, 40, 60, 120

7. 32 sandwiches are arranged on plates so each plate gets the same number of sandwiches. What are the possible numbers of plates needed?
1, 2, 4, 8, 16, 32

8. 54 flowers are to be arranged in an even number of vases so that each vase has the same number of flowers. There needs to be at least 5 vases and at most 20 vases. What are the possible numbers of vases needed?
Factors of 54: 1, 2, 3, 6, 9, 18, 27, 54
6 or 18 vases

Challenge

9. Circle the numbers that have an odd number of factors.

9 10 15 **25** **49** **81** **121**

10. What are the four numbers less than 50 that have exactly 3 factors?
Numbers with an odd number of factors are 1 × 1, 2 × 2, 3 × 3, etc, so check 1, 4, 9, 16, 25, 36, and 49.
The ones with 3 factors are 4, 9, 25, and 49.

Exercise 4

Basics

1 (a) Find all the factors of each of the following numbers.

19 1, 19	20 1, 2, 4, 5, 10, 20
21 1, 3, 7, 21	23 1, 23
27 1, 3, 9, 27	29 1, 29

(b) Which of these numbers have only 2 factors, and so are prime numbers?
19, 23, 29

(c) Which of these numbers have more than 2 factors, and so are composite numbers?
20, 21, 27

2 What two numbers are neither prime nor composite?
0, 1

Practice

3 (a) The prime numbers less than 10 are 2, 3, 5, and 7.

(b) The only even number that is a prime number is 2.

(c) Other than 5, which is prime, all odd numbers with 5 in the ones place are composite numbers since they are multiples of 5.

(d) Which of the following odd numbers less than 100 are composite numbers? Cross them off.

11	13	17	19	~~21~~	23	~~27~~	29
31	~~33~~	37	~~39~~	41	43	47	~~49~~
~~51~~	53	~~57~~	59	61	~~63~~	67	~~69~~
71	73	~~77~~	79	~~81~~	83	~~87~~	89
~~91~~	~~93~~	97	~~99~~				

(e) Using the above information, list the 25 prime numbers less than 100.
2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89, 97

4 Twin primes are pairs of prime numbers that have a difference of 2, for example, 11 and 13. Find all the twin primes less than 100.
3 and 5, 5 and 7, 11 and 13, 17 and 19, 29 and 31, 41 and 43, 59 and 61, 71 and 73

5 16 can be expressed as the sum of two prime numbers: 16 = 11 + 5. Find three other numbers greater than 10 and show how they can each be expressed as the sum of two prime numbers.
Answers will vary. Any even number can be expressed as the sum of two prime numbers.

6 An emirp is a pair of prime numbers with reversed digits, such as 37 and 73. List all the pairs of two-digit emirps.
Since numbers where the tens digit is even will be even numbers if the digits are reversed, and not prime, only numbers where the digit in the tens place is odd need to be checked.
13 and 31, 17 and 71, 37 and 73, 79 and 97.

7 Circle the number in the grid that obeys the following two rules.

Rule 1 The number is not in a row that contains a prime number.
Rule 2 The number is not in a column that contains a number that has an odd number of factors.

82	27	12	31
10	19	42	36
81	40	28	18
79	25	65	34

Exercise 5 • pages 60–62

Exercise 5

Basics

1 (a) $12 = 1 \times$ 12

$12 = 2 \times$ 6

$12 = 3 \times$ 4

The factors of 12 are 1, 2, 3, 4, 6, and 12.

(b) $20 = 1 \times$ 20

$20 = 2 \times$ 10

$20 = 4 \times$ 5

The factors of 20 are 1, 2, 4, 5, 10, and 20.

(c) The common factors of 12 and 20 are 1, 2, and 4.

(d) Which common factor of 12 and 20 is greatest? 4

2 Circle common factors of 36 and 42.

2 3 6 9 12 18 36

Practice

3 (a) Circle the numbers that have 4 and 5 as common factors.

5 20 35 40 48 65 100

(b) Circle the numbers that have 2, 3, and 6 as common factors.

6 18 24 30 42 81 120

4 Find all the common factors of each set of numbers.

(a) 24, 30

1, 2, 3, 6

(b) 48, 84

1, 2, 3, 4, 6, 12

(c) 35, 37, 90

1

5 75 black pens, 45 blue pens, and 30 red pens need to be put in boxes so that each box has the same number of each color of pen. What is the greatest number of boxes needed, and how many of each color pen will be in each box?

Common factors of 75, 45, and 30: 1, 3, 5, 15

Greatest common factor: 15

Greatest number of boxes: 15

Black pens: $75 \div 15 = 5$

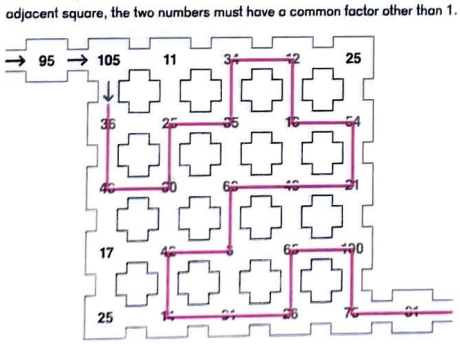
Blue pens: $45 \div 15 = 3$

Red pens: $30 \div 15 = 2$

15 boxes; 5 black pens, 3 blue pens, 2 red pens

Challenge

6 Continue a path through the maze. In order to move from one square to an adjacent square, the two numbers must have a common factor other than 1.



Exercise 6

Check

1. List the multiples of 6 that are between 30 and 80.
   36, 42, 48, 54, 60, 66, 72, 78

2. What number less than 200 is the greatest multiple of 5?
   195

3. Find the sum of the first four multiples of 3 and the first three multiples of 4.
   Multiples of 3: 3, 6, 9, 12
   Multiples of 4: 4, 8, 12
   3 + 6 + 9 + 12 + 4 + 8 + 12 = 54

4. Find the first three common multiples of each set of numbers.
   (a) 6, 15
   30, 60, 90

   (b) 8, 10, 12
   120, 240, 360

5. (a) What number is the least multiple of 38?
   38

   (b) What number is the greatest possible factor of 120?
   120

6. A 2-digit even number has 5 and 9 as factors. What number is it?
   Common multiples of 5 and 9: 45, 90, 135
   90

7. A 2-digit odd number is a factor of 54 and a multiple of 9. What number is it?
   Factors of 54: 1, 2, 3, 6, 9, 18, 27, 54
   Multiples of 9: 9, 18, 27, 36, 45, 54
   27

8. Find all the common factors of each set of numbers.
   (a) 30, 45
   1, 3, 5, 15

   (b) 30, 40, 100
   1, 2, 5, 10

9. Can the product of two prime numbers be an even number? Explain why or why not.
   Yes, if one of the prime numbers is 2. The product of any other pair of prime numbers would be odd, since the product of two odd numbers is odd.

10. Can the product of two prime numbers be a prime number? Explain why or why not.
    No. If a number is the product of two numbers (other than 1), then it is not a prime number.

11. A blue light blinks every 10 seconds. A red light blinks every 12 seconds. A green light blinks every 8 seconds. If all three lights just blinked at the same time, in how many seconds will they again blink at the same time?
    Least common multiple of 8, 10, and 12: 120
    120 seconds

12. A red ribbon is 64 inches long, a blue ribbon is 80 inches long, and a yellow ribbon is 96 inches long. They are all to be cut into shorter pieces of the same length without any leftover pieces. What is the longest possible length of each ribbon? How many pieces of each color of ribbon will there be?
    Common factors of 64, 80, and 96: 1, 2, 4, 8, 16
    Longest possible length is 16 in.
    Red ribbon: 64 ÷ 16 = 4; 4 pieces
    Blue ribbon: 80 ÷ 16 = 5; 5 pieces
    Yellow ribbon: 96 ÷ 16 = 6; 6 pieces

Challenge

13. A group of people are traveling together to camp. Each car can hold 5 people. If 4 people were to go in each car, there would be 3 people left over. If 5 people were to go in each car, there would be room for 2 more people in the last car. How many people and how many cars are there?
    When there are 4 people in each car, the remainder is 3. When there are 5 people in each car, the remainder is also 3, since 2 seats will be empty, leaving 3 occupied seats.
    Multiples of 4, added to 3: 7, 11, 15, 19, 23
    Multiples of 5, added to 3: 8, 13, 18, 23
    4 people in one car: 23 ÷ 4 is 5 R 3; 5 people in one car: 23 ÷ 5 is 4 R 3
    23 people and 5 cars

14. Emma found the difference between two prime numbers is 15. What are the two prime numbers?
    2, 17
    All prime numbers except for 2 are odd. The difference between two odd numbers is an even number. So one of the numbers must be 2.

15. A Sophie Germain prime is a prime number such that if 1 is added to twice that number, the answer is also a prime number. For example, 3 is a Sophie Germain prime number because 2 × 3 + 1 = 7, which is also prime. Find all the Sophie Germain primes that are less than 50.
    2, 3, 5, 11, 23, 29, and 41

Chapter 4 Multiplication

Exercise 1

Basics

1 (a) $12 \times 3 = 30 + 6 =$ 36

(10, 2)

(b) 12 hundreds × 3 = 36 hundreds = 3,600

(c) 12 thousands × 3 = 36 thousands = 36,000

2 (a) $35 \times 4 =$ 120 + 20 = 140

(30, 5)

(b) $350 \times 4 =$ 1,400

(c) $3{,}500 \times 4 =$ 14,000

(d) $35{,}000 \times 4 =$ 140,000

3 (a) $100 \times 7 =$ 700 (b) $200 \times 7 =$ 1,400

$99 \times 7 =$ 693 $199 \times 7 =$ 1,393

(c) $300 \times 7 =$ 2,100 (d) $3{,}000 \times 7 =$ 21,000

$299 \times 7 =$ 2,093 $2{,}999 \times 7 =$ 20,993

Practice

4 Use mental calculation to find the products.

(a) $100 \times 6 =$ 600 (b) $150 \times 9 =$ 1,350

(c) $40{,}000 \times 8 =$ 320,000 (d) $1{,}300 \times 5 =$ 6,500

(e) $2{,}500 \times 4 =$ 10,000 (f) $910 \times 2 =$ 1,820

(g) $15{,}000 \times 3 =$ 45,000 (h) $7{,}200 \times 8 =$ 57,600

(i) $5 \times 42{,}000 =$ 210,000 (j) $7 \times 3{,}300 =$ 23,100

(k) $98 \times 6 =$ 588 (l) $5 \times 399 =$ 1,995

(m) $3 \times 599 =$ 1,797 (n) $6{,}999 \times 4 =$ 27,996

5 A 24-foot-wide frame for a greenhouse costs $4,999. A farm wants to buy 5 of them. What will be the total cost?

$5 \times 4{,}999 = 24{,}995$

$24,995

6 The pediatric clinic needs 250 bandages a week. The central clinic needs 600 bandages a week. How many bandages should the two clinics order to have enough for 8 weeks?

$8 \times 250 = 2{,}000$ or $250 + 600 = 850$

$8 \times 600 = 4{,}800$ $8 \times 850 = 6{,}800$

$2{,}000 + 4{,}800 = 6{,}800$

6,800 band-aids

Exercise 2 • pages 69–72

Exercise 2

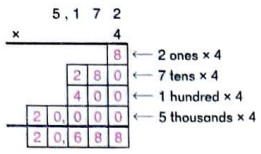
Basics

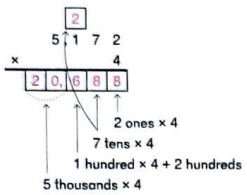
1 (a) Complete the following estimates for the product of 5,172 and 4.

5,172 × 4 → 5,000 × 4 = 20,000

5,172 × 4 → 5,200 × 4 = 20,800

(b) Fill in the missing numbers or digits for each calculation method.





(c) Compare the estimates to the actual product.
Which estimate was lower? 20,000
Which estimate was higher? 20,800
Which estimate was closer? 20,800

Practice

2 (a) Dion estimated the product of 3,521 and 3 to be 12,000. With what number did he replace 3,521? 4,000

(b) Mei estimated the product of 3,521 and 3 to be 9,900. With what number did she replace 3,521? 3,300

(c) Whose estimate will be closer to the actual product?
Mei's estimate.

(d) Find the product of 3,521 and 3.

		3,	5	2	1
×					3
	1	0,	5	6	3

3 Is 9,183 × 3 greater than or less than 25,000?
Estimate: 9,000 × 3 = 27,000
Greater than 25,000

4 The product of 4,962 and 8 is closest to which multiple of 10,000?
5,000 × 8 = 40,000
40,000

5 Are the following products reasonable? Why or why not?

(a) 7 × 986 = 6,902
7 × 1,000 = 7,000
Yes, it is close to the estimate.

(b) 71,081 × 8 = 57,448
70,000 × 8 = 560,000
No. The product should have 6 digits.

6 Estimate and then find the exact product. Estimates may vary.

(a) 8,292 × 3 ≈ ____
8,292 × 3 = 24,876

		8,	2	9	2
×					3
	2	4,	8	7	6

(b) 6,710 × 8 ≈ ____
6,710 × 8 = 53,680

		6,	7	1	0
×					8
	5	3,	6	8	0

(c) 6,114 × 7 ≈ ____
6,114 × 7 = 42,798

		6,	1	1	4
×					7
	4	2,	7	9	8

(d) 11,771 × 6 ≈ ____
11,771 × 6 = 70,626

	1	1,	7	7	1
×					6
	7	0,	6	2	6

7 A backhoe costs $12,199. An excavator costs $165,599. A construction company wants to buy 4 backhoes and 1 excavator. What is the total cost?
4 × 12,199 = 48,796
165,599 + 48,796 = 214,395
$214,395

Challenge

8 Find the products. Do you notice a pattern?

1,089 × 1 = 1,089
1,089 × 2 = 2,178
1,089 × 3 = 3,267
1,089 × 4 = 4,356
1,089 × 5 = 5,445
1,089 × 6 = 6,534
1,089 × 7 = 7,623
1,089 × 8 = 8,712
1,089 × 9 = 9,801

Pattern: Each number is 1,000 and 100 more, and 10 and 1 less, than the previous number.

9 In the following problem, the letters S, T, O, and P stand for different digits. What is the number POTS?

```
  S T O P
×       4
-------
P O T S
```

POTS = 8,712

```
    3 3
  2, 1 7 8
×        4
---------
  8, 7 1 2
```

Since the answer is 4-digits, S × 4 < 10. S could be 1 or 2. Since P × 4 = S, S is even. So S = 2 and P = 8. There is no regrouping from the hundreds place so T × 4 < 10. T = 1. Since 8 × 4 = 32, the ones digit of O × 4 + 3 is 1. Possible values for O are 0, 3, 5, 6, 7, or 9. Only 7 works.

Exercise 3

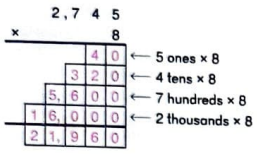
Basics

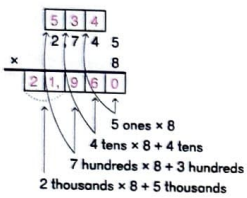
1 (a) Complete the following estimations for the product of 2,745 and 8.

2,745 × 8 → 3,000 × 8 = 24,000

2,745 × 8 → 2,500 × 8 = 20,000

(b) Fill in the missing numbers or digits for each calculation method.





(c) Compare the estimates to the actual product.
Which estimate was lower? 20,000
Which estimate was higher? 24,000
Which estimate was closer? 20,000

Practice

2 (a) Alex estimated the product of 52,891 and 4 to be 200,000. With what number did he replace 52,891?
50,000

(b) Sofia estimated the product of 52,891 and 4 to be 212,000. With what number did she replace 52,891?
53,000

(c) Whose estimate will be closer to the actual product?
Sofia's estimate

(d) Find the product of 52,891 and 4.

		5	2,	8	9	1
×						4
	2	1	1,	5	6	4

3 Is the product of 84,984 and 5 closer to 400,000 or 500,000?
85,000 × 5 = 425,000
400,000

4 Circle the number that is equal to 8,563 × 6 without calculating the exact product.

524,318 | 51,378 | 51,372 | 5,372

5 Which of the following gives the greatest product?

6,953 × 6 | 5,235 × 8 | 5,673 × 9

6 Estimate and then find the exact product. Estimates may vary.

(a) 7,884 × 4 ≈ ____
7,884 × 4 = 31,536

		7,	8	8	4
×					4
	3	1,	5	3	6

(b) 3,482 × 5 ≈ ____
3,482 × 5 = 17,410

		3,	4	8	2
×					5
	1	7,	4	1	0

(c) 6,908 × 7 ≈ ____
6,908 × 7 = 48,356

		6,	9	0	8
×					7
	4	8,	3	5	6

(d) 27,448 × 6 ≈ ____
27,448 × 6 = 164,688

	2	7,	4	4	8
×					6
1	6	4,	6	8	8

7 A leap year occurs every 4 years. A standard year has 365 days and a leap year has 366 days. How many days are in 4 consecutive years?
365 × 3 = 1,095 or 365 × 4 = 1,460
1,095 + 366 = 1,461 1,460 + 1 = 1,461
1,461 days

Challenge

8 Find the products. Do you notice a pattern?

9,999 × 1 = 9,999
9,999 × 2 = 19,998
9,999 × 3 = 29,997
9,999 × 4 = 39,996
9,999 × 5 = 49,995
9,999 × 6 = 59,994
9,999 × 7 = 69,993
9,999 × 8 = 79,992
9,999 × 9 = 89,991
9,999 × 10 = 99,990

Pattern: Each number is 10,000 more and 1 less than the previous number.

9 In the following problem, the letters G, R, E, A, and T stand for different digits. What is the number GREAT?

```
  1 G R E A T
×           3
-------------
G R E A T 1
```

GREAT = 42,857

```
    1   2 1 2
  1 4 2, 8 5 7
×             3
-------------
4 2 8, 5 7 1
```

Since 1 is in the ones place of the product, T = 7. The ones digit of A × 3 + 2 = 7, so A = 5. Similarly, E = 8, R = 2, and G = 4.

Exercise 4

Check

1. Is the product of 87,984 and 6 closer to 500,000 or 600,000?

90,000 × 6 = 540,000
500,000

2. Estimate to arrange the expressions in order from least to greatest.

16,953 × 3	21,992 × 2	7,673 × 7	4,813 × 9
A	B	C	D

D, B, A, C

3. Estimate and then find the exact product. Estimates may vary.

(a) 3,806 × 7 ≈ [ ]
3,806 × 7 = [26,642]

(b) 9,458 × 8 ≈ [ ]
9,458 × 8 = [75,664]

(c) 73,987 × 2 ≈ [ ]
73,987 × 2 = [147,974]

4. There are 5,280 feet in 1 mile. How many feet are in 8 miles?

5,280 × 8 = 42,240
42,240 feet

5. An artist sold 5 paintings for $3,410 each. If the frame, canvas, paint, and other material for each painting cost $155, how much profit did he make from the paintings after subtracting the cost of materials?

3,410 − 155 = 3,255
3,255 × 5 = 16,275
$16,275

6. An aquarium had 3,876 visitors one day. Each visitor was given 2 drink coupons and 3 food coupons to use at the food court. How many coupons were given out?

Coupons given to each visitor: 2 + 3 = 5
3,876 × 5 = 19,380
19,380 coupons

7. To raise money to rescue marine animals, 3 corporations pledged to give $55,600 each to the charity if their total contributions were matched by other donors. The amount was matched and an additional $4,590 was raised. How much money was raised for the charity in all?

55,600 × 6 = 333,600
333,600 + 4,590 = 338,190
$338,190

Challenge

8. Find the missing digits.

(a)
$$\begin{array}{r} 7\,6\,4\,3\,8 \\ \times\qquad\quad 7 \\ \hline 5\,3\,5\,,0\,6\,6 \end{array}$$

(b)
$$\begin{array}{r} 9\,1\,4\,0\,6 \\ \times\qquad\quad 4 \\ \hline 3\,6\,5\,,6\,2\,4 \end{array}$$

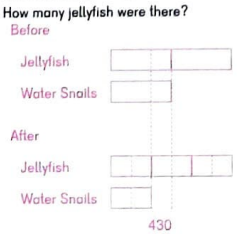
9. Alex's estimate: 6 × 896 ≈ 10 × 896 = 8,960
Emma's estimate: 6 × 896 ≈ 6 × 900 = 5,400

Both of them increased one factor by 4, but one of the estimates is much closer to the actual answer. Without calculating the answer, determine which estimate is closer and why.

Emma's estimate is closer. An increase of 6 by 4 has a greater impact on the product than an increase of 896 by 4.

10. In a large tank at an aquarium, there were twice as many jellyfish as water snails. After 430 snails were removed from the tank, there were 3 times as many jellyfish as water snails. How many jellyfish were there?

430 × 6 = 2,580
2,580 jellyfish



Check:
2,580 ÷ 3 = 860
860 + 430 = 1,290
1,290 × 2 = 2,580

Exercise 5 • pages 80–81

Exercise 5

Basics

1 (a) 90 × 10 = 900

(b) 900 × 10 = 9,000

(c) 46 × 10 = 460

(d) 46 × 100 = 4,600

(e) 80 × 10 = 800

(f) 800 × 100 = 80,000

2 (a) 6 × 3 = 18

(b) 60 × 30 = 1,800

(c) 600 × 3 = 1,800

(d) 6 × 300 = 1,800

(e) 600 × 30 = 18,000

(f) 60 × 300 = 18,000

3 (a) 62 × 30 = 62 × 3 × 10

= 186 × 10

= 1,860

(b) 620 × 30 = 620 × 3 × 10

= 1,860 × 10

= 18,600

4 Write the missing digits.

4	4	4
8 7	8 7	8 7 0
× 6	× 6 0	× 6 0
5 2 2	5, 2 2 0	5 2, 2 0 0
	87 × 6 × 10	870 × 6 × 10

Practice

5 Multiply.

7 0 × 4 = 2, 8 0	7 0 × 4 0 = 2, 8 0 0	8 7 × 5 = 4 3 5	8 7 × 5 0 = 4, 3 5 0
6 7 4 × 6 = 4, 0 4 4	6 7 4 × 6 0 = 4 0, 4 4 0	3 9 5 × 9 = 3, 5 5 5	3 9 5 × 9 0 = 3 5, 5 5 0
9 5 0 × 8 = 7, 6 0 0	9 5 0 × 8 0 = 7 6, 0 0 0	9 8 4 × 7 = 6, 8 8 8	9 8 4 × 7 0 = 6 8, 8 8 0

6 A snail has 33 teeth in 80 rows. How many teeth does the snail have?

33 × 80 = 2,640

2,640 teeth

7 How many minutes are in 28 hours?

28 × 60 = 1,680

1,680 minutes

8 How many seconds are in 40 hours?

40 × 60 = 2,400

2,400 × 60 = 144,000

144,000 seconds

Exercise 6 • pages 82–85

Exercise 6

Basics

1 (a) Estimate the product of 64 and 57. Estimates may vary.

64 × 57

□ × □ = □

(b) Write the missing numbers or digits.

		2	
		2	
		6	4
×		5	7
	4	4	8 ← 64 × 7
3,	2	0	0 ← 64 × 50
3,	6	4	8

2 (a) Alex estimated the product of 95 and 75 to be 8,000. With what number could he have replaced each factor?
He replaced 95 with 100 and 75 with 80.

(b) Mei estimated the product of 95 and 75 to be 7,200. With what number could she have replaced each factor?
She replaced 95 with 90 and 75 with 80.

(c) Whose estimate will be closer to the product?
Mei's estimate

(d) Find the product of 95 and 75.

			9	5
×			7	5
		4	7	5
	6,	6	5	0
	7,	1	2	5

Practice

3 Circle the number that is equal to 47 × 57 without calculating the exact product.

1,799	3,829	**2,679**	279

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

(a) 27 × 85 ≈ □

27 × 85 = 2,295

		2	7
×		8	5
	1	3	5
2,	1	6	0
2,	2	9	5

(b) 48 × 48 ≈ □

48 × 48 = 2,304

		4	8
×		4	8
	3	8	4
1,	9	2	0
2,	3	0	4

(c) 65 × 72 ≈ □

65 × 72 = 4,680

		6	5
×		7	2
	1	3	0
4,	5	5	0
4,	6	8	0

(d) 91 × 38 ≈ □

91 × 38 = 3,458

		9	1
×		3	8
	7	2	8
2,	7	3	0
3,	4	5	8

5 24 cookies can be baked on one baking sheet. The cafeteria cook bakes 25 sheets of cookies. Is this enough for 500 people to have at least one cookie?
Estimate is sufficient: 20 × 25 = 500
Yes. There will be more than 500.

6 Tickets to the aquarium cost $45 per adult and $35 per child. There are 9 adults and 64 children in a group.

(a) Without calculating the actual cost, determine whether the tickets for the entire group will cost less than $3,000.
Estimate high:
50 × 10 = 500
40 × 60 = 2,400
500 + 2,400 = 2,900
Yes.

(b) What is the total cost of the tickets for the group?
9 × 45 = 405
64 × 35 = 2,240
405 + 2,240 = 2,645
$2,645

7 Danios, barbs, and loaches are types of fish that live in Asian rivers. There are 63 danios in an Asian river fish habitat at the aquarium. There are five times as many barbs as danios and three times as many loaches as barbs. How many of these three types of fish are in the habitat in all?
1 unit ⟶ 63
21 units ⟶ 63 × 21 = 1,323
1,323 fish

63
Danios □
Barbs □□□□□
Loaches □□□□□□□□□□□□□□□

8 What will be the ones digit in the product of each of the following expressions? Is the product even or odd?

	Ones Digit	Even or Odd
2 × 3	6	Even
42 × 33	6	Even
5 × 3 × 3	5	Odd
85 × 33 × 3	5	Odd

Students should realize that they only have to multiply ones digits to find the ones digit of the products.

Challenge

9 Find the missing digits.

(a)

		3	4
×		1	8
	2	7	2
	3	4	0
	6	1	2

(b)

		1	7
×		6	5
		8	5
	1,	0	2	0
	1,	1	0	5

10 Tank A had 3 times as many fish as Tank B. After 240 fish were moved from Tank A to Tank B, Tank A had the same number of fish as Tank B. How many fish are in both tanks altogether?
240 × 4 = 960
960 fish

Before
A □□□
B □

After
A □□ 240
B □ 240

Exercise 7

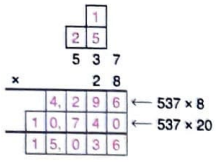
Basics

1 (a) Estimate the product of 537 and 28. Estimates may vary.

537 × 28

[ ] × [ ] = [ ]

(b) Fill in the missing numbers or digits.



2 (a) Sofia estimated the product of 649 and 15 to be 12,000. With what numbers could she have replaced each factor?

600 and 20

(b) Emma estimated the product of 649 and 15 to be 13,000. With what numbers could she have replaced each factor?

650 and 20

(c) Whose estimate will be closer to the actual product?

Sofia's estimate

(d) Find the product of 649 and 15.

		6	4	9
×			1	5
	3,	2	4	5
	6,	4	9	0
	9,	7	3	5

Practice

3 Circle the number that is equal to 845 × 62 without calculating the exact product.

56,390 | 5,230 | 52,390 | 25,390

4 There are 12 inches in a foot and 5,280 feet in a mile. Which is longer, 50,000 inches or 1 mile?

12 × 5,280 = 63,360

There are 63,360 inches in a mile.

1 mile is longer.

5 Estimate and then find the exact product. Estimates will vary.

(a) 638 × 48 ≈ [ ]

638 × 48 = 30,624

		6	3	8
×			4	8
	5,	1	0	4
2	5,	5	2	0
3	0,	6	2	4

(b) 512 × 72 ≈ [ ]

512 × 72 = 36,864

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

(c) 821 × 58 ≈ [ ]

821 × 58 = 47,618

		8	2	1
×			5	8
	6,	5	6	8
4	1,	0	5	0
4	7,	6	1	8

(d) 763 × 65 ≈ [ ]

763 × 65 = 49,595

		7	6	3
×			6	5
	3,	8	1	5
4	5,	7	8	0
4	9,	5	9	5

6 Each box contains 275 bandages. There were 14 full boxes and one box that contained 123 bandages. 3 full boxes were used. How many bandages are left?

Full boxes left: 14 − 3 = 11

Bandages left:

11 × 275 = 3,025

3,025 + 123 = 3,148

3,148 bandages

7 (a) Is the product of 4 × 9 × 7 × 1 odd or even? What is the ones digit of the product?

4 × 9 × 7 × 1 = 252

If any of the factors is even, then the product will be even.

Even

Ones digit: 2

(b) Is the product of 4 × 419 × 17 × 11 odd or even? What is the ones digit of the product?

It is only necessary to multiply the ones digits to determine the ones digit of the product.

Even

Ones digit: 2

8 Write down any 3-digit number. Multiply it by 11. Multiply your answer by 91. What do you notice about your final answer? Try other numbers.

If the chosen number is abc, with a, b, and c representing any digit, then the final answer is abc,abc.

Students are not required to explain why this occurs.

11 × 91 = 1,001

1,001 × abc = (1,000 + 1) × abc = abc000 + abc

Challenge

9 Find the missing digits.

(a)

		1	4	6
×			7	1
		1	4	6
	1	0,	2	2	0
1	0,	3	6	6

(b)

		8	7	3
×			9	3
	2,	6	1	9
7	8	5	7	0
8	1,	1	8	9

10 Consider the following examples.

28 × 25 = 7 × 4 × 25 = 7 × 100 = 700

36 × 50 = 18 × 2 × 50 = 18 × 100 = 1,800

18 × 35 = 9 × 2 × 5 × 7 = 9 × 7 × 10 = 630

Use similar methods to find the following products. Look for factors that together have a product of 10, 100, or 1,000.

(a) 16 × 25 = 400

(b) 25 × 44 = 1,100

(c) 14 × 45 = 630

(d) 26 × 15 = 390

(e) 75 × 12 = 900

(f) 50 × 168 = 8,400

(g) 250 × 36 = 9,000

(h) 125 × 16 = 2,000

Exercise 8

Check

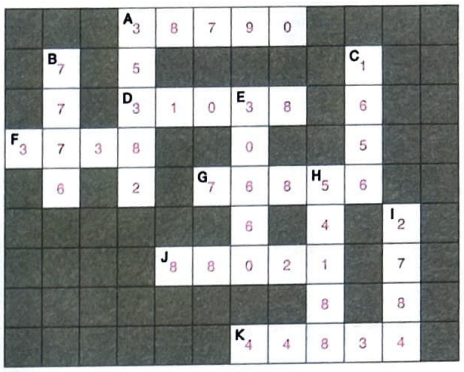
1 Multiply and use the answers to complete the cross number puzzle on the next page.

Across

862 × 45 = 38,790 (A)	739 × 42 = 31,038 (D)	89 × 42 = 3,738 (F)
9,607 × 8 = 76,856 (G)	989 × 89 = 88,021 (J)	773 × 58 = 44,834 (K)

Down

5,897 × 6 = 35,382 (A)	96 × 81 = 7,776 (B)	69 × 24 = 1,656 (C)
438 × 70 = 30,660 (E)	874 × 62 = 54,188 (H)	48 × 58 = 2,784 (I)



2 Write > or < in each ◯. Use estimation.

(a) 8,268 × 4 (>) 32,000

(b) 16 × 84 (<) 20 × 90

(c) 271 × 12 (>) 270 × 10

(d) 3,294 × 156 (<) 3,300 × 160

(e) 6,198 × 4 (>) 781 × 24

(f) 326 × 21 (<) 96 × 74

3 Is it possible to multiply a 2-digit whole number by a 2-digit whole number and get a number that is greater than 4 digits? Explain your answer.

No. The greatest possible product is 99 × 99 = 9,801, which is 4 digits.

4 The pumps and sand filters at the aquarium clean 942 gallons of water a minute. How many gallons do they clean in 45 minutes?

942 × 45 = 42,390

42,390 gallons

5 One of the buildings at the aquarium is getting new energy-saving light bulbs. Each light fixture holds 4 bulbs. There are 118 light fixtures on each floor. There are 4 floors in the building. How many light bulbs are needed?

118 × 4 × 4 = 1,888

1,888 light bulbs

6 The aquarium is selling T-shirts at a reduced price of $5 each to celebrate Earth Day. T-shirts are packaged 32 to a box. They ordered 19 boxes of large, 24 boxes of medium, and 22 boxes of small. If they sold all the T-shirts, how much money would they receive?

19 + 24 + 22 = 65

65 × 32 = 2,080

2,080 × 5 = 10,400

$10,400

Challenge

Consecutive numbers are numbers that come one after the other. For example, 3, 4, and 5 are three consecutive whole numbers.

7 What is the ones digit of the product of any 10 consecutive whole numbers?

0

Students should realize that they only have to concern themselves with the digit in the ones place, so they can look at single digits numbers. 10 consecutive numbers will always include either 0 or a multiple of 10, so their product will have 0 in the ones place.

8 What is the ones digit of the product of any 5 consecutive whole numbers?

0

Students may use trial and error using numbers within 20. Every set of 5 consecutive numbers will either contain 0 or a multiple of 10, or will contain one number with a 5 in the ones digit and another number that is even, resulting in a multiple of 10 when those two are multiplied together.

9 What are the possible ones digits for the products of any two consecutive whole numbers?

0, 2, 6

We only need to be concerned with the ones digit of the two numbers.

0 × 1 = 0, 1 × 2 = 2, 2 × 3 = 6, 3 × 4 = 12, 4 × 5 = 20, 5 × 6 = 30, 6 × 7 = 42, 7 × 8 = 56, 8 × 9 = 72, 9 × 10 = 90

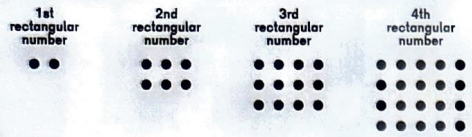
10 The product of 4 consecutive whole numbers is 3,024. What are the numbers?

6, 7, 8, 9

Students may use guess and check.

None of the numbers can be 10 or 5, or the product would end in 0. At least one of them must be less than 10, or the product would have at least 5 digits. Since they are consecutive, they all need to be less than 10, or one of them will be 10.

11 Study the pattern. How many dots will be in the 24th rectangular number?



Students can make charts listing the number of rows and dots in each row for 1, 2, 3, etc. and look for a pattern. The number of rows is the same as the rectangular number, and the number of dots in each row is one more than the rectangular number.
The 24th rectangular number has $24 \times 25 = 600$ dots.

Chapter 5 Division

Exercise 1

Basics

1 Use mental calculation to find the quotients.

(a) $63 \div 3 =$ 21
60 3

(b) $72 \div 3 =$ 24
60 12

(c) $55 \div 5 =$ 11
50 5

(d) $75 \div 5 =$ 15
50 25

(e) $48 \div 4 =$ 12
40 8

(f) $68 \div 4 =$ 17
40 28

2 (a) $72 \div 6 =$ 12

(b) 72 tens $\div 6 =$ 12 tens = 120

(c) 72 hundreds $\div 6 =$ 12 hundreds = 1,200

(d) 72 thousands $\div 6 =$ 12 thousands = 12,000

3 (a) $84 \div 7 =$ 12

(b) $840 \div 7 =$ 120

(c) $8{,}400 \div 7 =$ 1,200

(d) $84{,}000 \div 7 =$ 12,000

Practice

4 Use mental calculation to find the quotients.

(a) $40{,}000 \div 8 =$ 5,000

(b) $1{,}500 \div 5 =$ 300

(c) $3{,}600 \div 4 =$ 900

(d) $7{,}200 \div 9 =$ 800

(e) $2{,}400 \div 8 =$ 300

(f) $2{,}700 \div 3 =$ 900

(g) $28{,}000 \div 7 =$ 4,000

(h) $6{,}400 \div 8 =$ 800

(i) $45{,}000 \div 3 =$ 15,000

(j) $100 \div 5 =$ 20

(k) $91{,}000 \div 7 =$ 13,000

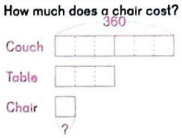
(l) $72{,}000 \div 4 =$ 18,000

(m) $10{,}800 \div 9 =$ 1,200

(n) $1{,}500 \div 2 =$ 750

5 A couch costs $360. It costs twice as much as a table. A table costs three times as much as a chair. How much does a chair cost?

1 unit ⟶ $360 \div 6 = 60$
$60



6 A factory produced 90,000 jars of jam in 6 hours. If it produces the same number of jars each hour, how many jars does it produce in 2 hours?

1 hour: $90{,}000 \div 6 = 15{,}000$
2 hours: $15{,}000 \times 2 = 30{,}000$
30,000 jars of jam

Exercise 2

Basics

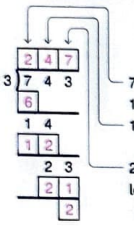
1 (a) Complete the following estimates for the quotient of 743 ÷ 3.

600 ÷ 3 = 200

750 ÷ 3 = 250

900 ÷ 3 = 300

(b) Divide 743 by 3.



7 hundreds ÷ 3 is 2 hundreds with 1 hundred left over.

14 tens ÷ 3 is 4 tens with 2 tens left over.

23 ones ÷ 3 is 7 ones with 2 ones left over.

743 ÷ 3 is 247 with a remainder of 2.

(c) Compare the estimates to the actual quotient. Which estimate(s) were lower? Which estimate(s) were higher? Which estimate was closest?

Lower: 200; Higher: 250, 300

Closest: 250

(d) Check: 247 × 3 + 2 = 743

Practice

2 (a) Emma's estimate: 878 ÷ 9 ≈ 900 ÷ 9

Alex's estimate: 878 ÷ 9 ≈ 880 ÷ 10

Mei's estimate: 878 ÷ 9 ≈ 810 ÷ 9

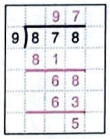
List the estimates in order from least to greatest.

Alex's estimate: 88

Mei's estimate: 90

Emma's estimate: 100

(b) Divide 878 by 9.



97 with a remainder of 5

3 Which of the following gives the greatest quotient? Circle it.

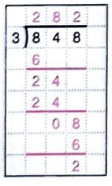
653 ÷ 7 | 700 ÷ 8 | **498 ÷ 5**

4 A community boating center had $200. It bought 6 identical life vests for its customers to use and had $8 left. Using estimation, circle the most reasonable cost for each life vest.

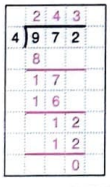
$21	**$32**	$48

5 (a) Estimate and then divide. Estimates may vary. Actual quotients provided.

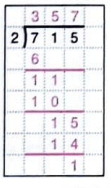
848 ÷ 3 ≈ ☐



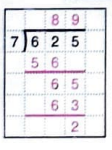
972 ÷ 4 ≈ ☐



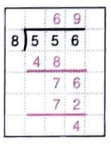
715 ÷ 2 ≈ ☐



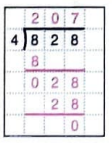
625 ÷ 7 ≈ ☐



556 ÷ 8 ≈ ☐



828 ÷ 4 ≈ ☐



(b) Put the quotients in order from least to greatest. Add the middle two numbers. Divide that answer by the sum of the remainders. You will get 50 if you did all the calculations correctly.

69 R 4, 89 R 2, 207, 243, 282 R 2, 357 R 1

4 + 2 + 2 + 1 = 9

207 + 243 = 450

450 ÷ 9 = 50

6 At a fair, balloons were given out in this order: yellow, blue, blue, red, red, red, yellow, blue, blue, red, red, red, and so on until 250 balloons were given out.

YBBRRRYBBRRR

(a) What color was the 250th balloon? Red

250 ÷ 6 is 41 R 4

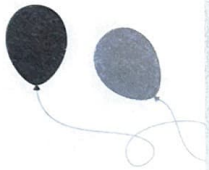
The 41st is the end of one unit, so the 4th one after that is red.

(b) How many red balloons were given out? 124

There are 3 red balloons in each set of 6.

Then 1 additional red balloon was given out.

41 × 3 + 1 = 124



Challenge

7 (a) Find the remainder of 68 ÷ 9.

5

Find the remainder of 69 ÷ 9.

6

Find the remainder of the sum of the two remainders divided by 9.

2

Find the remainder of 68 + 69 divided by 9.

2

What do you notice? Try it with some other numbers.

The two remainders, from the last two steps, are the same.

Answers will vary.

(b) Find the remainder when 17 + 15 + 11 is divided by 4.

Find the sum of the remainders when each of the addends is divided by 4. Then find the remainder when that sum is divided by 4.

1 + 3 + 3 = 7; 7 ÷ 4 is 1 with a remainder of 3.

3

(c) Find the remainder when 69 + 69 + 74 + 58 is divided by 8.

5 + 5 + 2 + 2 = 14

14 ÷ 8 is 1 with a remainder of 6.

6

Exercise 3

Basics

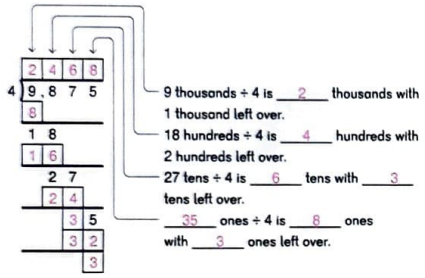
1 (a) Complete the following estimations for the quotient of 9,875 ÷ 4.

8,000 ÷ 4 = 2,000

10,000 ÷ 4 = 2,500

12,000 ÷ 4 = 3,000

(b) Divide 9,875 by 4.



9 thousands ÷ 4 is 2 thousands with 1 thousand left over.

18 hundreds ÷ 4 is 4 hundreds with 2 hundreds left over.

27 tens ÷ 4 is 6 tens with 3 tens left over.

35 ones ÷ 4 is 8 ones with 3 ones left over.

9,875 ÷ 4 is 2,468 with a remainder of 3.

(c) Compare the estimates to the actual quotient. Which estimate(s) were lower? Which estimate(s) were higher? Which estimate was closest?
Lower: 2,000; Higher: 2,500, 3,000; Closest: 2,500

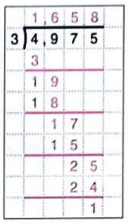
(d) Check: 2,468 × 4 + 3 = 9,875

Practice

2 (a) Sofia's estimate: 4,975 ÷ 3 ≈ 3,000 ÷ 3
Mei's estimate: 4,975 ÷ 3 ≈ 6,000 ÷ 3
Dion's estimate: 4,975 ÷ 3 ≈ 4,500 ÷ 3

List the estimates in order from least to greatest.
Sofia's estimate: 1,000, Dion's estimate: 1,500, Mei's estimate: 2,000

(b) Divide 4,975 by 3.



1,658 R 1

3 6,798 ÷ 5 is closest to which number? Circle it.

150	1,000	1,500	2,000

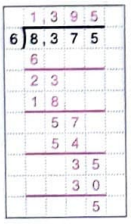
4 Two of these expressions have the same quotient. Circle them.

4,950 ÷ 6	6,531 ÷ 7	3,780 ÷ 5	2,799 ÷ 3

5 Is the quotient of 7,489 ÷ 8 three or four digits?
Three digits

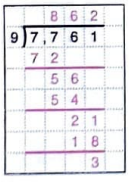
6 (a) Estimate and then divide. Estimates may vary. Actual quotients provided.

8,375 ÷ 6 ≈ ☐

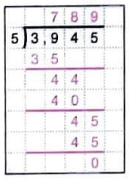


9,971 ÷ 2 ≈ ☐

7,761 ÷ 9 ≈ ☐



3,945 ÷ 5 ≈ ☐



(b) Add the quotients and the remainders together, then divide that sum by 5. You will get 1,608 if you did all the calculations correctly.
1,395 + 4,985 + 862 + 789 + 5 + 1 + 3 = 8,040
8,040 ÷ 5 = 1,608

7 How many egg cartons are needed for 2,560 eggs if each carton holds 6 eggs?
2,560 ÷ 6 is 426 R 4
427 cartons

8 Students are seated in the following order on a train: 1 = left window, 2 = left aisle, 3 = right aisle, 4 = right window, 5 = left window, etc. Jacob gets seat 1,423. Where is his seat?

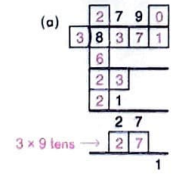
left window	left aisle	right aisle	right window

1,423 ÷ 4 is 355 R 3

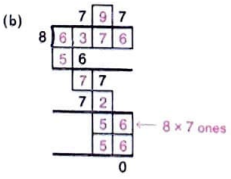
Challenge

9 Find the missing numbers.

(a)



(b)



Exercise 4

Check

1 Use mental calculation to find the quotients.

(a) 2,000 ÷ 5 = 400

(b) 560 ÷ 8 = 70

(c) 90,000 ÷ 6 = 15,000

(d) 15,000 ÷ 2 = 7,500

(e) 6,400 ÷ 4 = 1,600

(f) 75,000 ÷ 3 = 25,000

2 Circle the number that is equal to 6,461 ÷ 7. Use estimation.

795 | 893 | **923** | 1,373

3 Two of these expressions have the same quotient. Circle them.

598 ÷ 6 | **1,400 ÷ 8** | **875 ÷ 5** | 4,007 ÷ 3

4 Write > or < in each ◯. Use estimation.

(a) 8,268 ÷ 4 (>) 2,000

(b) 842 ÷ 7 (<) 276 ÷ 2

(c) 3,824 ÷ 9 (<) 4,000 ÷ 8

(d) 5,723 ÷ 6 (<) 4,789 ÷ 4

(e) 9,199 ÷ 3 (>) 587 × 4

(f) 7,155 ÷ 8 (<) 528 + 679

5 (a) Divide.

8,989 ÷ 8 1,123 R 5 A	5,693 ÷ 7 813 R 2 B
6,725 ÷ 5 1,345 C	5,301 ÷ 9 589 D
8,655 ÷ 6 1,442 R 3 E	6,754 ÷ 2 3,377 F

(b) Write the digits of the answers and the remainders from problems A to F in order below. Add consecutive numbers together. If you did all the calculations correctly, you will discover a pattern.

1, 1, 2, 3, 5, 8, 13, 21, 34,

55, 89, 144, 233, 377 ...

The sum of consecutive numbers is the next number.

6 6 kayak paddles cost $348. What is the cost of 1 kayak paddle?

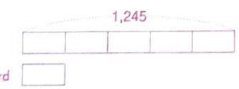
348 ÷ 6 = 58

$58

7 A 5-person pedal boat costs 5 times as much as a stand-up paddle board. If the pedal boat costs $1,245, how much does the paddle board cost?

1 unit ⟶ 1,245 ÷ 5 = 249

$249



8 A community boating center had $2,000. It bought 8 identical kayaks and had $8 left. How much did each kayak cost?

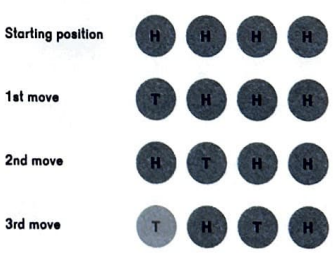
2,000 − 8 = 1,992

1,992 ÷ 8 = 249

$249

Challenge

9 Mei plays a game with coins. She puts 4 coins in a row, heads up. In the first move, she turns over the first coin. In the second move, she turns over the first two coins. In the third move, she turns over the first three coins. In the fourth move, she turns over all four coins. In the fifth move, she starts over again, turning over the first coin. And so on. What side of each coin is facing up after 1,995 moves?



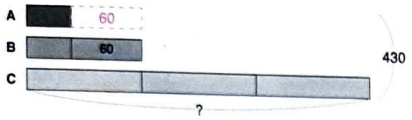
...

Students can make a table and continue the pattern. At the end of the 8th move, the coins are all heads up again. The 9th move will be like the 1st move. The pattern repeats every 8 times. 1,995 ÷ 8 is 249 with a remainder of 3. So after the 1,995th move the positions will be the same as after the 3rd move: T, H, T, H.

Exercise 5

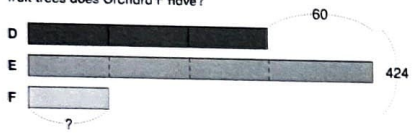
Basics

1 There are 3 neighboring orchards, A, B, and C. Orchard A has 60 fewer fruit trees than Orchard B. Orchard C has 3 times as many fruit trees as Orchard B. If the three orchards have 430 fruit trees altogether, how many fruit trees does Orchard C have?



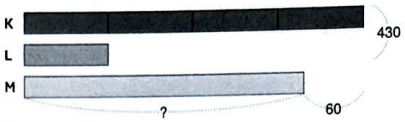
5 units ⟶ 430 + 60 = 490
1 unit ⟶ 490 ÷ 5 = 98
3 units ⟶ 3 × 98 = 294
294 fruit trees

2 There are 3 neighboring orchards, D, E, and F. Orchard D has 60 fewer fruit trees than Orchard E. Orchard D has 3 times as many fruit trees as Orchard F. If the three orchards have 424 fruit trees altogether, how many fruit trees does Orchard F have?



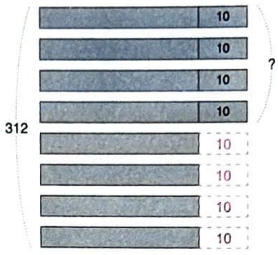
7 units ⟶ 424 − 60 = 364
1 unit ⟶ 364 ÷ 7 = 52
52 fruit trees

3 There are 3 neighboring orchards, K, L, and M. Orchard K has 4 times as many fruit trees as Orchard L. Orchard M has 60 fewer fruit trees than Orchard K. If Orchards K and L together have 430 fruit trees, how many fruit trees does Orchard M have?



5 units ⟶ 430
1 unit ⟶ 430 ÷ 5 = 86
4 units ⟶ 4 × 86 = 344
Orchard M: 344 − 60 = 284
284 fruit trees

4 A paddle for adults costs $10 more than a paddle for kids. The boating center bought 4 of each type of paddle. The total cost was $312. What was the total cost for 4 adult-sized paddles?

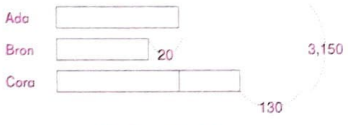


10 × 4 = 40
8 units ⟶ 312 + 40 = 352
4 units ⟶ 352 ÷ 2 = 176
$176

Practice

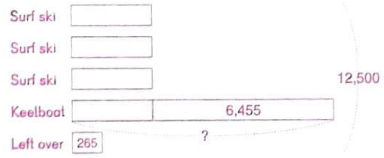
Methods may vary.

5 Three siblings bought a small sailboat together. The sailboat cost $3,150. Ada contributed $20 more than Bron. Cora contributed $130 less than twice as much money as Ada. How much money did Bron contribute?



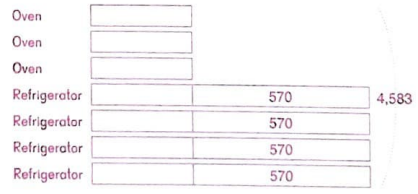
4 units ⟶ 3,150 + 130 + 20 = 3,300
1 unit ⟶ 3,300 ÷ 4 = 825
825 − 20 = 805
$805

6 A community boating center had $12,500. It bought 3 surf skis and 1 keelboat and had $265 left over. The keelboat cost $6,455 more than a surf ski. How much did the keelboat cost?



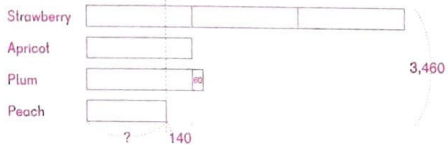
4 units ⟶ 12,500 − 265 − 6,455 = 5,780
1 unit ⟶ 5,780 ÷ 4 = 1,445
Keelboat: 1,445 + 6,455 = 7,900
$7,900

7 An apartment complex manager is replacing some of the appliances. He bought 3 ovens and 4 refrigerators for $4,583. Each oven cost $570 less than a refrigerator. What is the cost of one oven?



4 × 570 = 2,280
7 units ⟶ 4,583 − 2,280 = 2,303
1 unit ⟶ 2,303 ÷ 7 = 329
$329

8 A factory produced 3,460 jars of jam. It produced 3 times as many jars of strawberry jam as apricot jam, 60 more jars of plum jam than apricot jam, and 140 fewer jars of peach jam than apricot jam. How many jars of peach jam did it produce?

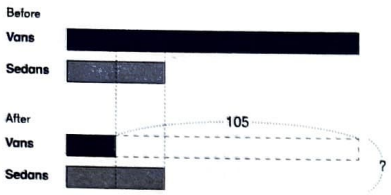


6 units ⟶ 3,460 − 60 + 140 = 3,540
1 unit ⟶ 3,540 ÷ 6 = 590
590 − 140 = 450
450 jars of peach jam

Exercise 6

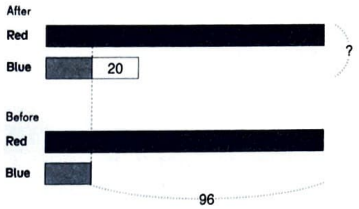
Basics

1 In a car sales lot there were three times as many vans as sedans. After 105 vans were sold, there were twice as many sedans as vans. How many cars were there in the end?

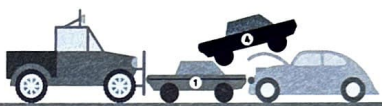


1 unit ⟶ 105 ÷ 5 = 21
3 units ⟶ 3 × 21 = 63
63 cars

2 A box of toy cars has 96 more red cars than blue cars. After 20 blue cars were added, it had 3 times as many red cars as blue cars. How many cars were there in the end?

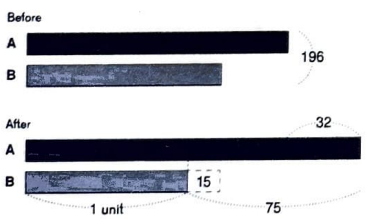


2 units ⟶ 96 − 20 = 76
1 unit ⟶ 76 ÷ 2 = 38
4 units ⟶ 4 × 38 = 152
152 cars



Practice

3 2 fish tanks, A and B, had a total of 196 fish. Tank A has more fish than Tank B. After 32 fish were added to Tank A and 15 fish in Tank B were sold, Tank A had 75 more fish than Tank B. How many fish did each tank have at first?



Total number of fish after:

196 + 32 − 15 = 213
213 fish

Value of 1 unit:

2 units ⟶ 213 − 75 = 138
1 unit ⟶ 138 ÷ 2 = 69
69 fish

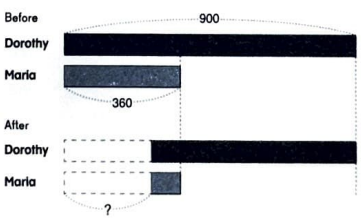
Number of fish in Tank A at first:

69 + 75 − 32 = 112
112 fish

Number of fish in Tank B at first:

69 + 15 = 84
84 fish

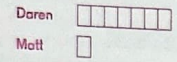
4 Dorothy has $900 and Maria has $360. They each bought a couch at the same price. Now, Dorothy has 7 times as much money as Maria. How much did the couch cost?



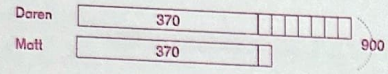
6 units ⟶ 900 − 360 = 540
1 unit ⟶ 540 ÷ 6 = 90
Price of couch: 360 − 90 = 270
$270

5 Daren saved 7 times as much money as Matt. They both saved another $370. Now they have $900 altogether. How much money has Daren saved?

Before



After



2 × 370 = 740
8 units ⟶ 900 − 740 = 160
1 unit ⟶ 160 ÷ 8 = 20
7 units ⟶ 7 × 20 = 140
140 + 370 = 510
$510

Exercise 7 • pages 118–120

Exercise 7

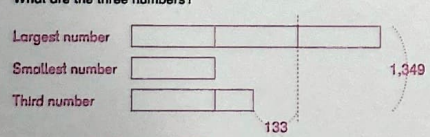
Check

1 Divide.

(a) 9,886 ÷ 6
1,647 R 4

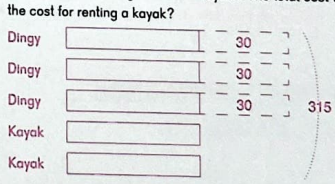
(b) 4,009 ÷ 7
572 R 5

2 The sum of three numbers is 1,349. The greatest number is three times the least number. The third number is 133 less than twice the least number. What are the three numbers?



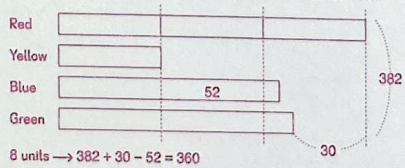
6 units ⟶ 1,349 + 133 = 1,482
1 unit ⟶ 1,482 ÷ 6 = 247
3 units ⟶ 3 × 247 = 741
2 units ⟶ 2 × 247 = 494
Largest number: 741
Smallest number: 247
Third number: 494 − 133 = 361

3 A boating center rents out dinghies, kayaks, and keelboats for 4 hours. The cost for renting a dinghy is $30 more than the cost of renting a kayak. A group rented 3 dinghies and 2 kayaks. The total cost was $315. What is the cost for renting a kayak?



3 × 30 = 90
5 units ⟶ 315 − 90 = 225
1 unit ⟶ 225 ÷ 5 = 45
$45

4 A bin has 382 red, yellow, blue, and green balls. It has three times as many red balls as yellow balls, 52 more blue balls than yellow balls, and 30 fewer green balls than red balls. How many green balls does it have?



8 units ⟶ 382 + 30 − 52 = 360
1 unit ⟶ 360 ÷ 8 = 45
3 units ⟶ 3 × 45 = 135
135 − 30 = 105
105 green balls

5 Cody wants to buy some apple trees for his property. He needs $48 more to buy 3 apple trees. After getting $240 more, he had enough money to buy 5 apple trees. How much does 1 apple tree cost?

Cost of last 2 apple trees: 240 − 48 = 192

Cost of 1 apple tree: 192 ÷ 2 = 96

$96

6 A number with the hundreds digit of 3 and tens digit of 2 is divided by 9. The remainder is 5. What are the possible ones digit of the number?

0 or 9

324 is a multiple of 9 (The sum of the digits is 9). A number with a remainder of 5 when divided by 9 is 5 more or 4 less than a multiple of 9.

324 + 5 = 329

324 − 4 = 320

Students might instead simply try dividing 320 by 9, which does have a remainder of 5, and realize another such number is 9 more.

Exercise 8 • pages 121–126

Check

1

Number	Rounded to the nearest			
	100,000	10,000	1,000	100
134,710	100,000	130,000	135,000	134,700
634,550	600,000	630,000	635,000	634,600
98,432	100,000	100,000	98,000	98,400
250,500	300,000	250,000	251,000	250,500

2 The number 83,238 is a palindrome. It is the same read from left to right and from right to left (ignoring the comma). What is the 10th palindrome after 83,238?

83338, 83438, 83538, 83638, 83738, 83838, 83938, 84048, 84148, 84248

10th palindrome: 84,248

3 Use the clues to find the mystery 6-digit number.

Clue 1 All the digits are different.

Clue 2 The digit 9 is in the ten thousands place. Ten thousands place: 9

Clue 3 The digit in the hundreds place is 6 less than the digit in the ten thousands place. Hundreds place: 9 − 6 = 3

Clue 4 One of the digits stands for 5,000. Thousands place: 5

Clue 5 The number is less than 200,000. Hundred thousands place: 1

Clue 6 The digit in the tens place stands for 0. Tens place: 0

Clue 7 The number is an odd number. Ones place: 7

195,307

4 Use estimation to arrange the expressions in order from least to greatest.

(a)

A	B	C	D
32 × 76	846 + 1,158	8,462 − 4,981	178 × 8

D, B, A, C

(b)

A	B	C
16,982 + 33,174	756 × 72	409,563 − 343,669

A, B, C

5 List all the common factors of 30 and 45.

1, 3, 5, 15

6 List the first four common multiples of 3, 4, and 6.

12, 24, 36, 48

7 (a) Can the sum of two prime numbers be an odd number? Explain why or why not.

Yes, but only if one of the numbers is 2. All prime numbers other than 2 are odd and the sum of two odd numbers is even.

(b) Can the product of two prime numbers be an odd number? Explain why or why not.

Yes, except for 2 all prime number are odd and the product of two odd numbers is odd.

8 A 2-digit odd number is a factor of 60 and a multiple of 3. What is the number?

15

9 Use the clues to determine which number, 61, 23, 72, or 51, is on the other side of the cards A, B, C, and D.

Clue 1 A prime number is between two composite numbers.
Clue 2 The odd multiple of 3 has no card to the right of it.
Clue 3 The least number is not between two cards.

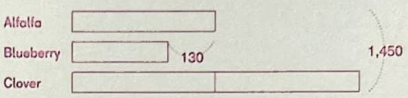
A	B	C	D
23	72	61	51

61 and 23 are prime. The only odd multiple of 3 is 51.

10 A community boating center had 3 fundraisers last year for their youth sailing program. At the first fundraiser, they raised $18,945. At the second fundraiser, they raised $7,285 more than at the first fundraiser. At the third fundraiser, they raised $5,982 less than at the second fundraiser. How much money did they raise in all?

First fundraiser: 18,945
Second fundraiser: 18,945 + 7,285 = 26,230
Third fundraiser: 26,230 − 5,982 = 20,248
Total: 18,945 + 26,230 + 20,248 = 65,423
$65,423

11 A vendor at a farmers market is selling honey. He has 1,450 jars in total of alfalfa, blueberry, and clover honey. He has 130 more jars of alfalfa honey than blueberry honey. He has twice as many jars of clover honey as alfalfa honey. How many jars of alfalfa honey does he have?

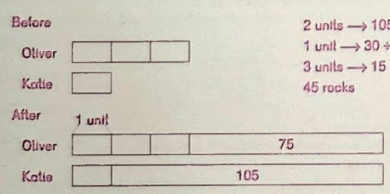


4 units ⟶ 1,450 + 130 = 1,580
1 unit ⟶ 1,580 ÷ 4 = 395
395 jars of alfalfa honey

12 3 ships leave a port on January 31. The first one returns to the port every 4 weeks, the second one every 8 weeks, and the third one every 10 weeks. In how many weeks will they all be in the port again?

The least common multiple of 4, 8, 10 is 40.
40 weeks

13 Oliver had 3 times as many rocks in his collection as Katie. Then Oliver collected 75 more rocks and Katie collected 105 more rocks. Now Katie has the same number of rocks as Oliver. How many rocks did Oliver have at first?



2 units ⟶ 105 − 75 = 30
1 unit ⟶ 30 ÷ 2 = 15
3 units ⟶ 15 × 3 = 45
45 rocks

Challenge

14 This year, John's age is a multiple of 3. Last year, his age was 1 less than a multiple of 4. Next year, his age will be 3 more than a multiple of 5. What is the youngest age he could be?

Multiples of 3: 3, 6, 9, 12, 15, 18, 21
Multiples of 4 − 1 + 1: 4, 8, 12, 16, 20
Multiples of 5 + 3 − 1: 7, 12, 17, 22
12 years old

15 In a textbook, 900 digits are used for the page numbers. How many pages are in the textbook, starting with page 1? (Hint: First find how many digits are used for pages 1-9 and 10-99.)

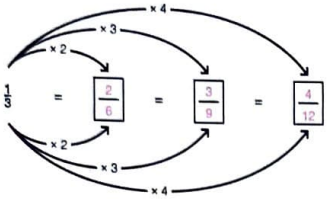
Pages 1- 9: 9 pages with 1 digit each. 9 × 1 = 9 digits
Pages 10 - 99: 90 pages with 2 digits each. 90 × 2 = 180 digits
Pages with 3 digits would be 100-999, assume for now there are fewer than 999 pages.
Number of digits on the remaining pages: 900 − 189 = 711
711 ÷ 3 = 237
99 + 237 = 336
336 pages

Chapter 6 Fractions

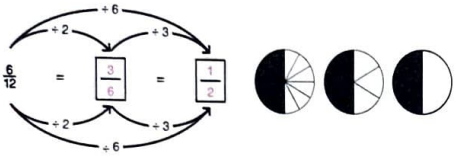
Exercise 1

Basics

1. Write the equivalent fractions.



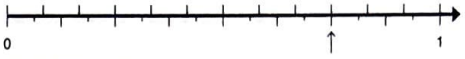
2. Simplify the fractions.



The simplest form of $\frac{6}{12}$ is $\frac{1}{2}$.

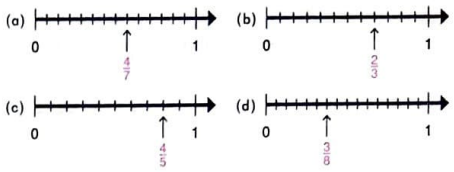
Practice

3. Write the missing numbers for the fraction indicated by the arrow.



$\frac{3}{4} = \frac{6}{8} = \frac{9}{12} = \frac{12}{16}$

4. Label the tick marks indicated by the arrows as fractions in simplest form.



5. Express each fraction in simplest form.

(a) $\frac{6}{9} = \frac{2}{3}$ (b) $\frac{6}{8} = \frac{3}{4}$

(c) $\frac{6}{15} = \frac{2}{5}$ (d) $\frac{10}{12} = \frac{5}{6}$

(e) $\frac{21}{42} = \frac{1}{2}$ (f) $\frac{24}{32} = \frac{3}{4}$

(g) $\frac{42}{56} = \frac{3}{4}$ (h) $\frac{18}{72} = \frac{1}{4}$

6. **Write the missing numbers.**

(a) $\frac{28}{42} = \frac{14}{21} = \frac{2}{3} = \frac{6}{9} = \frac{18}{27}$

(b) $\frac{75}{100} = \frac{15}{20} = \frac{3}{4} = \frac{9}{12} = \frac{27}{36}$

7. Find the equivalent fractions.

(a) $\frac{5}{10} = \frac{1}{2}$ (b) $\frac{1}{2} = \frac{8}{16}$ (c) $\frac{5}{10} = \frac{8}{16}$

(d) $\frac{6}{9} = \frac{2}{3}$ (e) $\frac{2}{3} = \frac{8}{12}$ (f) $\frac{6}{9} = \frac{8}{12}$

(g) $\frac{6}{8} = \frac{3}{4}$ (h) $\frac{3}{4} = \frac{9}{12}$ (i) $\frac{6}{8} = \frac{9}{12}$

(j) $\frac{8}{10} = \frac{4}{5}$ (k) $\frac{12}{15} = \frac{4}{5}$ (l) $\frac{8}{10} = \frac{12}{15}$

(m) $\frac{3}{6} = \frac{4}{8}$ (n) $\frac{12}{16} = \frac{15}{20}$ (o) $\frac{24}{30} = \frac{16}{20}$

Challenge

8. The fractions below form a number pattern. What is the missing fraction?

$\frac{5}{12}, \frac{1}{2}, \frac{7}{12}, \frac{2}{3}, \frac{3}{4}$

The numbers increase by $\frac{1}{12}$.

Exercise 2

Basics

1. Write > or < in each ◯.

(a) $\frac{5}{12} \bigcirc \frac{7}{12}$

(b) $\frac{5}{12} \bigcirc \frac{5}{6}$

2. Label the correct tick marks for the given fractions on the number lines. Then find equivalent fractions. Write > or < in each ◯.

$\frac{2}{3} = \frac{8}{12}$

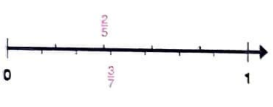
$\frac{7}{12}$

$\frac{2}{3} \bigcirc \frac{7}{12}$

$\frac{3}{5} = \frac{9}{15}$

$\frac{9}{16}$

$\frac{3}{5} \bigcirc \frac{9}{16}$



$\frac{2}{5} = \frac{14}{35}$ or $\frac{6}{15}$

$\frac{3}{7} = \frac{15}{35}$ or $\frac{6}{14}$

$\frac{2}{5} \bigcirc \frac{3}{7}$

3. Write >, <, or = in each ◯.

(a) $\frac{4}{8} \bigcirc \frac{1}{2}$ | $\frac{5}{8} \bigcirc \frac{1}{2}$ | $\frac{3}{8} \bigcirc \frac{1}{2}$

(b) $\frac{6}{12} \bigcirc \frac{1}{2}$ | $\frac{6}{13} \bigcirc \frac{1}{2}$ | $\frac{6}{11} \bigcirc \frac{1}{2}$

(c) $\frac{6}{13} \bigcirc \frac{6}{8}$ | $\frac{6}{11} \bigcirc \frac{3}{8}$

4. (a) Label $\frac{4}{5}$ and $\frac{6}{7}$ on the number line.

(b) $\frac{4}{8}$ and $\boxed{\frac{1}{8}}$ make 1. | $\frac{6}{7}$ and $\boxed{\frac{1}{7}}$ make 1.

(c) Which fraction is closer to 1?

$\frac{6}{7}$

Which fraction is greater?

$\frac{6}{7}$

Practice

5. Write > or < in each ◯.

(a) $\frac{7}{8} \bigcirc \frac{3}{4}$

(b) $\frac{3}{8} \bigcirc \frac{7}{16}$

(c) $\frac{4}{9} \bigcirc \frac{8}{8}$

(d) $\frac{3}{4} \bigcirc \frac{9}{11}$

(e) $\frac{2}{3} \bigcirc \frac{3}{8}$

(f) $\frac{5}{12} \bigcirc \frac{7}{16}$

(g) $\frac{10}{11} \bigcirc \frac{8}{8}$

(h) $\frac{15}{16} \bigcirc \frac{10}{11}$

6. Circle the fractions that are less than $\frac{1}{2}$. Then write the fractions in order from least to greatest.

$\frac{3}{8}$ $\frac{8}{11}$ $\frac{3}{5}$ $\frac{5}{16}$ $\frac{8}{16}$ $\frac{5}{12}$

$\frac{5}{16}, \frac{3}{8}, \frac{5}{12}, \frac{8}{15}, \frac{3}{5}, \frac{8}{11}$

7. Write the fractions in order from least to greatest.

(a) $\frac{5}{6}, \frac{6}{7}, \frac{3}{5}$ $\frac{3}{5}, \frac{5}{6}, \frac{6}{7}$

(b) $\frac{8}{9}, \frac{23}{50}, \frac{12}{13}$ $\frac{23}{50}, \frac{8}{9}, \frac{12}{13}$

(c) $\frac{13}{16}, \frac{2}{5}, \frac{5}{8}, \frac{7}{7}$ $\frac{2}{5}, \frac{5}{8}, \frac{13}{16}, \frac{7}{7}$

(d) $\frac{7}{12}, \frac{8}{7}, \frac{5}{14}, \frac{31}{48}$ $\frac{5}{14}, \frac{8}{7}, \frac{7}{12}, \frac{31}{48}$

Compare each to $\frac{1}{2}$ or 1 first, and then compare those less than $\frac{1}{2}$ and greater than $\frac{1}{2}$ to each other, finding equivalent fractions with either common numerators or common denominators.

Challenge

8. Use each of the given numbers to fill in the missing numerators or denominators so that the fractions are in order from least to greatest. Each fraction should be less than 1 and in simplest form.

(a) 5, 6, 7, 8 $\frac{3}{8} < \frac{7}{12} < \frac{5}{6}$

(b) 7, 8, 9, 10, 11, 12 $\frac{7}{8} < \frac{9}{10} < \frac{11}{12}$

Answers may vary.

Exercise 3

Basics

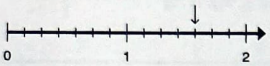
1. Write an improper fraction for each of the following.

(a) 

8 fifths = $\frac{8}{5}$

(b) 

9 thirds = $\frac{9}{3}$

(c) 

11 sevenths = $\frac{11}{7}$

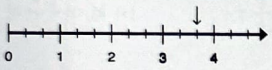
2. Write a mixed number for each of the following.

(a) 

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

(b) 

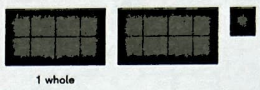
$1 + \frac{8}{12} = 1\frac{2}{3}$

(c) 

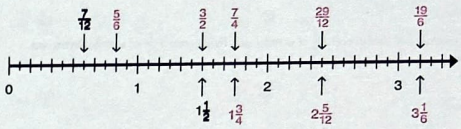
$3 + \frac{2}{3} = 3\frac{2}{3}$

Practice

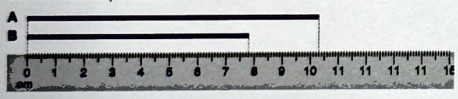
3. Express each of the following as a mixed number and as an improper fraction in simplest form.

	Mixed Number	Improper Fraction
 1 whole	$2\frac{1}{8}$	$\frac{17}{8}$
 1 whole	$3\frac{5}{6}$	$\frac{23}{6}$
 1 whole	$4\frac{4}{9}$	$\frac{40}{9}$

4. Finish labeling each arrow with a fraction above the number line and a mixed number below the number line. Use simplest form.



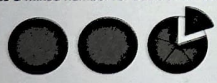
5. Write the length of each line in centimeters as both a mixed number and a fraction. Use simplest form.



A $10\frac{3}{10}, \frac{103}{10}$

B $7\frac{4}{5}, \frac{39}{5}$

6. Write a mixed number for each of the following.

(a) 

$3 - \frac{1}{5} = 2\frac{4}{5}$

(b) 

$4 - \frac{2}{9} = 3\frac{7}{9}$

7. Express each value as a mixed number in simplest form.

(a) $3 + \frac{2}{3}$ $3\frac{2}{3}$

(b) $4 - \frac{4}{9}$ $3\frac{5}{9}$

(c) $5 + \frac{3}{4}$ $5\frac{3}{4}$

(d) $8 - \frac{6}{12}$ $7\frac{1}{2}$

(e) $\frac{8}{14} + 8$ $8\frac{4}{7}$

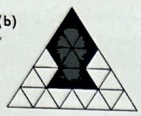
(f) $3 - \frac{7}{15}$ $2\frac{8}{15}$

Exercise 4

Check

1 Write the fraction for the shaded part of each shape in simplest form.

(a)  $\frac{3}{7}$

(b)  $\frac{2}{5}$

2 Which fractions are greater than 1?

$\frac{8}{5}$ $\frac{7}{16}$ $\frac{11}{9}$ $\frac{15}{13}$ $\frac{6}{15}$

3 Which fraction is closest to 1?

$\frac{3}{4}$ $\frac{1}{2}$ $\frac{4}{5}$ $\frac{5}{6}$ $\frac{2}{3}$

4 Write > or < in each ◯.

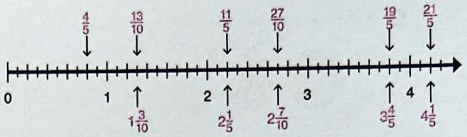
(a) $\frac{5}{8} < \frac{8}{5}$ (b) $2\frac{3}{5} > 2\frac{7}{15}$ (c) $\frac{11}{8} > \frac{5}{4}$

5 In a relay race, Aisha ran $1\frac{3}{4}$ of a mile and Paula ran $1\frac{5}{12}$ of a mile. Who ran farther?

$1\frac{3}{4} > 1\frac{5}{12}$

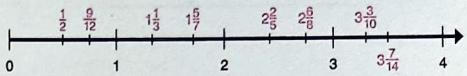
Aisha

6 Label each arrow with a fraction above the number line and a mixed number below the number line. Use simplest form.



7 Label the tick marks on the number line with the given numbers.

$3\frac{3}{10}, 2\frac{2}{5}, 1\frac{1}{2}, 1\frac{1}{3}, \frac{9}{12}, 3\frac{7}{14}, 1\frac{5}{7}, 2\frac{6}{8}$



8 Write the missing numerators or denominators. Each fraction should be in simplest form.

(a) $\frac{2}{8} < \frac{\boxed{1}}{4} < \frac{2}{7}$ (b) $\frac{1}{2} < \frac{\boxed{3}}{5} < \frac{3}{4}$

(c) $\frac{3}{4} < \frac{\boxed{4}}{5} < 1$ (d) $2\frac{2}{3} < 2\frac{\boxed{8}}{11} < 2\frac{4}{5}$

Challenge

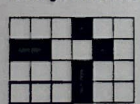
9 List all the different fractions between 0 and 1 that are in simplest form where the denominators are 10 or less.

$\frac{1}{10}, \frac{1}{9}, \frac{1}{8}, \frac{1}{7}, \frac{1}{6}, \frac{1}{5}, \frac{1}{4}, \frac{1}{3}, \frac{1}{2}, \frac{2}{9}, \frac{2}{7}, \frac{2}{5}, \frac{2}{3}, \frac{3}{10}, \frac{3}{8}, \frac{3}{7}, \frac{3}{5}, \frac{3}{4}, \frac{4}{9}, \frac{4}{7}, \frac{4}{5}, \frac{5}{9}, \frac{5}{8}, \frac{5}{7}, \frac{5}{6}, \frac{6}{7}, \frac{7}{10}, \frac{7}{9}, \frac{7}{8}, \frac{8}{9}, \frac{9}{10}$

10 (a) How many more squares need to be shaded in order to have $\frac{4}{8}$ of the rectangle unshaded?

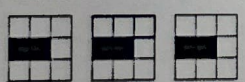
5 more squares

(b) How many more squares need to be shaded in order to have $\frac{1}{4}$ of the rectangle unshaded?



12 more squares

(c) How many more squares need to be shaded in order to have $1\frac{2}{3}$ unshaded?

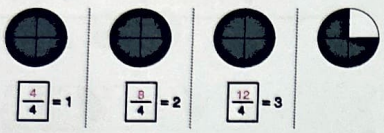


1 whole 8 more squares

Exercise 5

Basics

1 (a) Express $\frac{15}{4}$ as a mixed number.

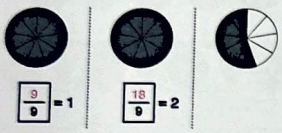


$\frac{15}{4} = \frac{12}{4} + \frac{3}{4}$

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

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

(b) Express $\frac{23}{9}$ as a mixed number.



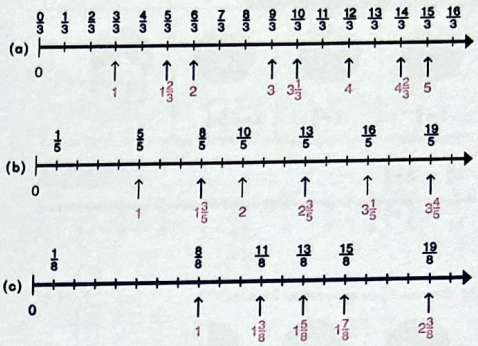
$\frac{23}{9} = \frac{18}{9} + \frac{5}{9}$

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

$= 2\frac{5}{9}$

Practice

2 Label each arrow with a mixed number in simplest form or a whole number.



3 Express each improper fraction as a whole number.

(a) $\frac{15}{5}$ 3

(b) $\frac{90}{9}$ 10

(c) $\frac{24}{2}$ 12

(d) $\frac{40}{8}$ 5

(e) $\frac{54}{6}$ 9

(f) $\frac{56}{7}$ 8

4 Express each improper fraction as a mixed number in simplest form.

(a) $\frac{18}{4} = \frac{16}{4} + \frac{2}{4}$

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

(b) $\frac{27}{5} = \frac{25}{5} + \frac{2}{5}$

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

(c) $\frac{16}{7} = \frac{14}{7} + \frac{2}{7}$

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

(d) $\frac{9}{4} = \frac{8}{4} + \frac{1}{4}$

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

(e) $\frac{20}{6} = \frac{18}{6} + \frac{2}{6}$

$= 3\frac{1}{3}$

(f) $\frac{11}{2} = \frac{10}{2} + \frac{1}{2}$

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

(g) $\frac{20}{8} = \frac{16}{8} + \frac{4}{8}$

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

(h) $\frac{30}{9} = \frac{27}{9} + \frac{3}{9}$

$= 3\frac{1}{3}$

5 Write the following numbers in order from least to greatest.

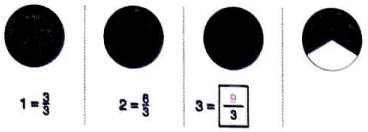
$\frac{16}{5}, \frac{23}{7}, \frac{14}{3}$

$\frac{23}{7}, \frac{16}{5}, \frac{14}{3}$

Exercise 6

Basics

1 (a) Express $3\frac{2}{3}$ as an improper fraction.



$1 = \frac{3}{3}$ $2 = \frac{6}{3}$ $3 = \boxed{\frac{9}{3}}$

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

$= \frac{9}{3} + \frac{2}{3}$

$= \frac{11}{3}$

(b) Express $2\frac{5}{8}$ as an improper fraction.

$1 = \boxed{\frac{8}{8}}$ $2 = \boxed{\frac{16}{8}}$

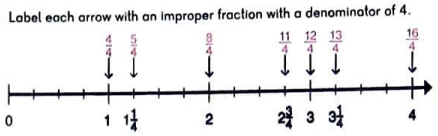
$2\frac{5}{8} = 2 + \boxed{\frac{5}{8}}$

$= \boxed{\frac{16}{8}} + \boxed{\frac{5}{8}}$

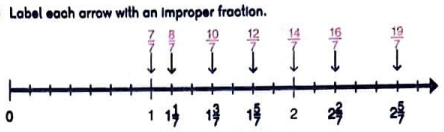
$= \frac{21}{8}$

Practice

2 Label each arrow with an improper fraction with a denominator of 4.



3 Label each arrow with an improper fraction.



4 Express each whole number as an improper fraction with the given denominator.

(a) $2 = \boxed{\frac{18}{9}}$ (b) $3 = \boxed{\frac{24}{8}}$

(c) $4 = \boxed{\frac{20}{5}}$ (d) $5 = \boxed{\frac{15}{3}}$

(e) $4 = \boxed{\frac{48}{12}}$ (f) $8 = \boxed{\frac{128}{16}}$

5 Express each value as an improper fraction.

(a) $3\frac{2}{6} = \frac{18}{6} + \frac{2}{6}$

$= \frac{17}{5}$

(b) $5\frac{2}{9} = \frac{45}{9} + \frac{2}{9}$

$= \frac{47}{9}$

(c) $4\frac{5}{6} = \frac{24}{6} + \frac{5}{6}$

$= \frac{29}{6}$

(d) $7\frac{1}{7} = \frac{49}{7} + \frac{1}{7}$

$= \frac{50}{7}$

(e) $5\frac{7}{10} = \frac{50}{10} + \frac{7}{10}$

$= \frac{57}{10}$

(f) $6\frac{5}{8} = \frac{48}{8} + \frac{5}{8}$

$= \frac{53}{8}$

(g) $2\frac{5}{12} = \frac{24}{12} + \frac{5}{12}$

$= \frac{29}{12}$

(h) $11\frac{2}{3} = \frac{33}{3} + \frac{2}{3}$

$= \frac{35}{3}$

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

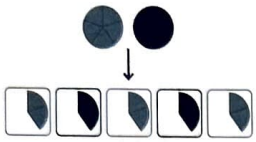
$\frac{14}{3}, 3\frac{3}{7}, \frac{21}{4}$

$3\frac{3}{7}, \frac{14}{3}, \frac{21}{4}$

Exercise 7

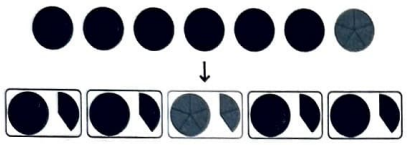
Basics

1 (a) Divide 2 by 5. Write the answer as a fraction.



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

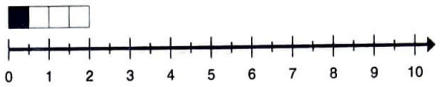
(b) Divide 7 by 5. Write the answer as a mixed number.



$7 \div 5 = 1\frac{2}{5}$

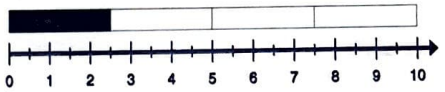
$5\overline{)7}$ → 1, remainder 2

2 (a) Divide 2 by 4. Write the answer as a fraction in simplest form.



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

(b) Divide 10 by 4. Write the answer as a mixed number in simplest form.



$4\overline{)10}$ → 2, remainder 2

$10 \div 4 = 2\frac{2}{4} = 2\frac{1}{2}$

3 Express each improper fraction as a mixed number in simplest form.

(a) $\frac{50}{7} = 50 \div 7$

$7\overline{)50}$ → 7, remainder 1

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

(b) $\frac{56}{6} = 56 \div 6$

$6\overline{)56}$ → 9, remainder 2

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

Practice

4 Divide. Express answers 1 or greater as whole or mixed numbers. Use simplest form.

(a) $3 \div 7$ $\frac{3}{7}$

(b) $8 \div 10$ $\frac{4}{5}$

(c) $\frac{45}{3}$ 15

(d) $31 \div 9$ $3\frac{4}{9}$

(e) $32 \div 6$ $5\frac{1}{3}$

(f) $49 \div 5$ $9\frac{4}{5}$

(g) $\frac{45}{4}$ $11\frac{1}{4}$

(h) $79 \div 5$ $15\frac{4}{5}$

5 A 38 oz box of cereal has 8 servings. How many ounces are in each serving?

$38 \div 8 = \frac{38}{8} = 4\frac{3}{4}$

$4\frac{3}{4}$ ounces

Exercise 8

Check

1. Express each mixed number as an improper fraction.

(a) $9\frac{1}{2}$ $\frac{19}{2}$

(b) $6\frac{2}{3}$ $\frac{20}{3}$

(c) $10\frac{5}{6}$ $\frac{65}{6}$

(d) $8\frac{4}{9}$ $\frac{76}{9}$

2. Express each value as a whole number or mixed number in simplest form.

(a) $\frac{25}{2}$ $12\frac{1}{2}$

(b) $\frac{51}{7}$ $7\frac{2}{7}$

(c) $\frac{45}{4}$ $11\frac{1}{2}$

(d) $\frac{40}{3}$ $13\frac{1}{3}$

(e) $46 \div 8$ $5\frac{3}{4}$

(f) $85 \div 9$ $9\frac{4}{9}$

3. 45 pounds of rice is divided equally into 6 bags. How many pounds of rice are in each bag?

$45 \div 6 = \frac{45}{6} = 7\frac{1}{2}$

$7\frac{1}{2}$ pounds

4. Continue the patterns. Express numbers 1 or greater as whole or mixed numbers. Use simplest form.

(a) Count on by three fourths starting with $\frac{1}{4}$.

$\frac{1}{4}$, 1, $1\frac{3}{4}$, $2\frac{1}{2}$, $3\frac{1}{4}$, 4, $4\frac{3}{4}$, $5\frac{1}{2}$, $6\frac{1}{4}$

(b) Count on by three eighths starting with $\frac{1}{8}$.

$\frac{1}{8}$, $\frac{1}{2}$, $\frac{7}{8}$, $1\frac{1}{4}$, $1\frac{5}{8}$, 2, $2\frac{3}{8}$, $2\frac{3}{4}$

(c) Count on by two ninths starting with $\frac{2}{9}$.

$\frac{2}{9}$, $\frac{4}{9}$, $\frac{2}{3}$, $\frac{8}{9}$, $1\frac{1}{9}$, $1\frac{1}{3}$, $1\frac{5}{9}$, $1\frac{7}{9}$

5. Write the numbers in order from least to greatest.

(a) $\frac{16}{3}$, $4\frac{7}{8}$, $\frac{29}{6}$

$\frac{26}{6}$, $4\frac{7}{8}$, $\frac{16}{3}$

(b) $\frac{42}{10}$, $\frac{60}{9}$, $\frac{52}{7}$, $\frac{28}{5}$

$\frac{42}{10}$, $\frac{28}{5}$, $\frac{60}{9}$, $\frac{52}{7}$

6. (a) Which fraction is closest to 5?

$\frac{14}{3}$ $\frac{19}{4}$ $\frac{11}{5}$ $\frac{43}{8}$

(b) Which fraction is closest to 10?

$\frac{58}{6}$ $\frac{50}{4}$ $\frac{68}{7}$ $\frac{78}{8}$

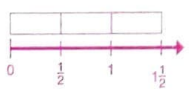
7. Write the whole numbers that are between $\frac{19}{3}$ and $\frac{47}{4}$.

7, 8, 9, 10, 11

Challenge

8. One half is one third of what mixed number?

$1\frac{1}{2}$



9. Two lumps of clay weigh the same. If you put 1 lump of clay on one side of a balance, and $\frac{2}{5}$ of the second lump of clay along with a $\frac{1}{2}$ kg weight on the other side of the balance, the two sides are balanced. How much does a lump of clay weigh?

$\frac{2}{5}$ of each lump must be $\frac{1}{2}$ kg. If 2 fifths is half a kilogram, then 1 fifth is a fourth of a kilogram. 5 fifths is $\frac{5}{4}$ kg or $1\frac{1}{4}$ kg. Students may draw a picture.

Chapter 7 Adding and Subtracting Fractions

Exercise 1

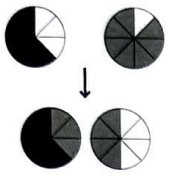
Basics

1 (a) Add $\frac{5}{8}$ and $\frac{7}{8}$.

$\frac{5}{8} + \frac{7}{8} = \boxed{\frac{12}{8}}$

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

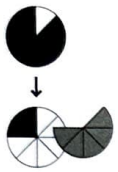
$= 1\boxed{\frac{1}{2}}$



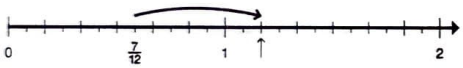
(b) Subtract $\frac{5}{8}$ from $\frac{7}{8}$.

$\frac{7}{8} - \frac{5}{8} = \boxed{\frac{2}{8}}$

$= \boxed{\frac{1}{4}}$

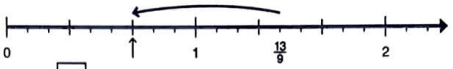


2 Add $\frac{7}{12}$ and $\frac{7}{12}$.



$\frac{7}{12} + \frac{7}{12} = \boxed{\frac{14}{12}} = \boxed{\frac{7}{6}} = 1\boxed{\frac{1}{6}}$

3 Subtract $\frac{7}{9}$ from $\frac{13}{9}$. Express the answer in simplest form.



$\frac{13}{9} - \frac{7}{9} = \boxed{\frac{2}{3}}$

Practice

Express answers 1 or greater as whole or mixed numbers. Use simplest form.

4 Add or subtract.

(a) $\frac{1}{12} + \frac{5}{12}$ $\frac{1}{2}$

(b) $\frac{4}{8} + \frac{5}{8}$ $1\frac{1}{8}$

(c) $\frac{9}{10} - \frac{5}{10}$ $\frac{2}{5}$

(d) $\frac{7}{10} + \frac{9}{10}$ $1\frac{3}{5}$

(e) $\frac{11}{13} - \frac{4}{13}$ $\frac{7}{13}$

(f) $\frac{11}{15} + \frac{13}{15}$ $1\frac{3}{5}$

(g) $\frac{15}{8} - \frac{11}{8}$ $\frac{1}{2}$

(h) $\frac{23}{20} + \frac{17}{20}$ 2

(i) $\frac{4}{25} + \frac{8}{25} + \frac{7}{25}$ $\frac{4}{5}$

(j) $\frac{23}{30} - \frac{17}{30}$ $\frac{1}{5}$

5 A bag of rice weighs $\frac{13}{16}$ lb. A bag of wheat berries weighs $\frac{9}{16}$ lb more than the bag of rice. A bag of rye berries weighs $\frac{11}{16}$ lb less than the bag of wheat berries. What is the total weight of all three bags of grain?

Wheat berries: $\frac{13}{16} + \frac{9}{16} = \frac{22}{16}$

Rye berries: $\frac{22}{16} - \frac{11}{16} = \frac{11}{16}$

Total: $\frac{13}{16} + \frac{22}{16} + \frac{11}{16} = 2\frac{7}{8}$

Challenge

6 Write the missing digits. The fractions should be less than 1.

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

(b) $\frac{\boxed{13}}{15} - \frac{\boxed{8}}{15} = \frac{\boxed{1}}{3}$

Exercise 2

Basics

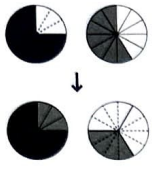
1 (a) Add $\frac{3}{4}$ and $\frac{7}{12}$.

$\frac{3}{4} + \frac{7}{12} = \boxed{\frac{9}{12}} + \frac{7}{12}$

$= \boxed{\frac{16}{12}}$

$= 1\boxed{\frac{4}{12}}$

$= 1\boxed{\frac{1}{3}}$

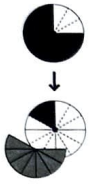


(b) Subtract $\frac{7}{12}$ from $\frac{3}{4}$.

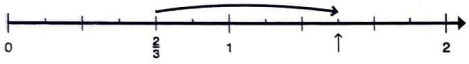
$\frac{3}{4} - \frac{7}{12} = \boxed{\frac{9}{12}} - \frac{7}{12}$

$= \boxed{\frac{2}{12}}$

$= \boxed{\frac{1}{6}}$

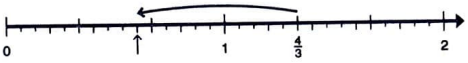


2 Add $\frac{2}{3}$ and $\frac{5}{6}$.



$\frac{2}{3} + \frac{5}{6} = \boxed{\frac{4}{6}} + \frac{5}{6} = \boxed{\frac{9}{6}} = \boxed{\frac{3}{2}} = 1\boxed{\frac{1}{2}}$

3 Subtract $\frac{11}{15}$ from $\frac{4}{3}$. Express the answer in simplest form.



$\frac{4}{3} - \frac{11}{15} = \boxed{\frac{20}{15}} - \frac{11}{15} = \boxed{\frac{9}{15}} = \boxed{\frac{3}{5}}$

Practice

Express answers 1 or greater as whole or mixed numbers. Use simplest form.

4 Add.

(a) $\frac{1}{2} + \frac{3}{14}$ $\frac{5}{7}$

(b) $\frac{5}{12} + \frac{3}{4}$ $1\frac{1}{6}$

(c) $\frac{9}{8} + \frac{11}{24}$ $1\frac{7}{12}$

(d) $\frac{2}{3} + \frac{7}{9}$ $1\frac{4}{9}$

(e) $\frac{4}{5} + \frac{3}{10} + \frac{7}{10}$ $1\frac{4}{5}$

(f) $\frac{4}{9} + \frac{17}{36} + \frac{11}{18}$ $1\frac{19}{36}$

5 Subtract.

(a) $\frac{11}{14} - \frac{4}{7}$ $\frac{3}{14}$

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

(c) $\frac{7}{5} - \frac{4}{15}$ $1\frac{2}{15}$

(d) $\frac{8}{9} - \frac{2}{3}$ $\frac{2}{9}$

(e) $\frac{24}{25} - \frac{2}{5} - \frac{7}{50}$ $\frac{21}{50}$

(f) $\frac{11}{12} - \frac{2}{3} - \frac{1}{4}$ 0

6 $\frac{3}{10}$ of a pole is painted red, $\frac{1}{5}$ of the pole is painted yellow, and the rest of the pole is painted blue. What fraction of the pole is painted blue?

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

$= \frac{5}{10}$

$\frac{1}{2}$ of the pole

Exercise 3

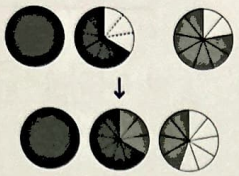
Basics

1 Add $1\frac{8}{9}$ and $\frac{7}{9}$.

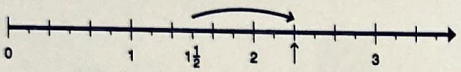
$1\frac{8}{9} + \frac{7}{9} = 1\frac{6}{9} + \frac{7}{9}$

$= 1\frac{13}{9}$

$= 2\frac{4}{9}$



2 Add $1\frac{1}{2}$ and $\frac{5}{6}$.



$1\frac{1}{2} + \frac{5}{6} = 1\frac{3}{6} + \frac{5}{6} = 1\frac{8}{6} = 1\frac{4}{3} = 2\frac{1}{3}$

3 Add $\frac{3}{4}$ and $7\frac{5}{12}$.

$\frac{3}{4} + 7\frac{5}{12} = \frac{9}{12} + 7\frac{5}{12} = 7\frac{14}{12} = 7\frac{7}{6} = 8\frac{1}{6}$

Practice

Express answers 1 or greater as whole or mixed numbers. Use simplest form.

4 Add.

(a) $4\frac{3}{4} + \frac{3}{8}$ $5\frac{1}{8}$

(b) $6\frac{1}{2} + \frac{5}{12}$ $6\frac{11}{12}$

(c) $\frac{4}{9} + 4\frac{2}{3}$ $5\frac{1}{9}$

(d) $8\frac{4}{5} + \frac{7}{20}$ $9\frac{3}{20}$

(e) $\frac{11}{14} + 2\frac{4}{7}$ $3\frac{5}{14}$

(f) $\frac{5}{6} + 5\frac{13}{18}$ $6\frac{5}{9}$

(g) $\frac{1}{6} + \frac{7}{30} + 3\frac{1}{3}$ $3\frac{11}{15}$

(h) $\frac{2}{3} + 6\frac{3}{4} + \frac{7}{12}$ 8

5 Aurora ran $3\frac{3}{4}$ miles on Saturday. On Sunday, she ran $\frac{5}{12}$ miles farther than on Saturday. How far did she run on Sunday?

Sunday: $3\frac{3}{4} + \frac{5}{12} = 4\frac{1}{6}$

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

Challenge

6 Complete each problem using the given digits. Fractions should all be in simplest form.

(a) 12, 13, 14, 15

$\frac{13}{24} + 14\frac{7}{8} = 15\frac{5}{12}$

(b) 1, 3, 4, 5, 8

$4\frac{2}{3} + \frac{8}{15} = 5\frac{1}{5}$

Exercise 4 • pages 160–161

Exercise 4

Basics

1 Add.

(a) $6\frac{1}{4} + 7\frac{7}{12} = 13\frac{1}{4} + \frac{7}{12}$

$= 13\frac{\boxed{3}}{12} + \frac{7}{12}$

$= 13\frac{10}{12}$

$= 13\frac{\boxed{5}}{6}$

(b) $4\frac{11}{24} + 2\frac{7}{8} = 6\frac{11}{24} + \frac{7}{8}$

$= 6\frac{11}{24} + \frac{\boxed{21}}{24}$

$= 6\frac{32}{24}$

$= 7\frac{\boxed{8}}{24}$

$= 7\frac{\boxed{1}}{3}$

Practice

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

(a) $7\frac{2}{6} + 4\frac{1}{3}$ $11\frac{5}{6}$

(b) $6\frac{1}{2} + 2\frac{5}{14}$ $8\frac{6}{7}$

(c) $4\frac{1}{3} + 3\frac{1}{6}$ $7\frac{1}{2}$

(d) $8\frac{3}{4} + 4\frac{3}{20}$ $12\frac{9}{10}$

(e) $1\frac{5}{12} + 3\frac{2}{3}$ $5\frac{5}{12}$

(f) $5\frac{1}{2} + 4\frac{5}{8}$ $10\frac{1}{8}$

(g) $6\frac{5}{8} + 2\frac{1}{16}$ $8\frac{7}{8}$

(h) $3\frac{3}{4} + 3\frac{7}{12}$ $7\frac{1}{3}$

(i) $4\frac{1}{3} + 2\frac{5}{12} + 3\frac{1}{3}$ $10\frac{1}{12}$

(j) $1\frac{1}{2} + 6\frac{3}{4} + 5\frac{7}{8}$ $14\frac{1}{8}$

3 After using $2\frac{5}{8}$ yards of fabric to make a dress, Gina still had $7\frac{3}{4}$ yards of fabric left. How many yards of fabric did she have at first?

$2\frac{5}{8} + 7\frac{3}{4} = 10\frac{3}{8}$

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

Exercise 5 • pages 162–164

Exercise 5

Basics

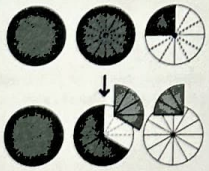
1 Subtract $\frac{7}{12}$ from $2\frac{1}{4}$.

$2\frac{1}{4} - \frac{7}{12} = 2\frac{\boxed{3}}{12} - \frac{7}{12}$

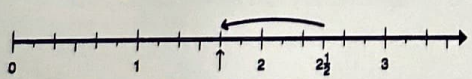
$= 1\frac{15}{12} - \frac{7}{12}$

$= 1\frac{\boxed{8}}{12}$

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



2 Subtract $\frac{5}{6}$ from $2\frac{1}{2}$.



$2\frac{1}{2} - \frac{5}{6} = 2\frac{\boxed{3}}{6} - \frac{5}{6} = 1\frac{\boxed{9}}{6} - \frac{5}{6} = 1\frac{\boxed{4}}{6} = 1\frac{\boxed{2}}{3}$

3 Subtract $\frac{5}{8}$ from $5\frac{5}{16}$.

$5\frac{5}{16} - \frac{5}{8} = 5\frac{5}{16} - \frac{\boxed{10}}{16} = 4\frac{\boxed{21}}{16} - \frac{\boxed{10}}{16} = 4\frac{\boxed{11}}{16}$

Practice

Express all answers as mixed numbers in simplest form.

4 Subtract.

(a) $4\frac{3}{4} - \frac{3}{8}$ $4\frac{3}{8}$

(b) $4\frac{5}{6} - \frac{2}{3}$ $4\frac{2}{9}$

(c) $6\frac{1}{2} - \frac{7}{12}$ $5\frac{11}{12}$

(d) $8\frac{4}{5} - \frac{7}{20}$ $8\frac{9}{20}$

(e) $9\frac{5}{14} - \frac{4}{7}$ $8\frac{11}{14}$

(f) $3\frac{1}{6} - \frac{13}{18}$ $2\frac{4}{9}$

(g) $8\frac{1}{6} - \frac{7}{30} - \frac{1}{3}$ $7\frac{3}{5}$

(h) $9\frac{2}{3} - \frac{3}{4} - \frac{7}{12}$ $8\frac{1}{3}$

5 Andrei spent $3\frac{1}{2}$ hours working in his garden on Saturday. He spent $\frac{3}{4}$ of an hour less time working in his garden on Sunday than on Saturday. How much time did he spend working in his garden on Sunday?

Sunday: $3\frac{1}{2} - \frac{3}{4} = 2\frac{3}{4}$

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

Challenge

6 Complete each problem using the given digits. All numbers should be in simplest form.

(a) 1, 2, 3

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

(b) 3, 4, 7, 8, 9, 21

$9\frac{5}{21} - \frac{2}{3} = 8\frac{4}{7}$

Exercise 6 • pages 165–166

Exercise 6

Basics

1 Subtract.

(a) $7\frac{5}{16} - 2\frac{7}{8} = 5\frac{5}{16} - \frac{7}{8}$

$= 5\frac{5}{16} - \frac{14}{16}$

$= 4\frac{21}{16} - \frac{14}{16}$

$= 4\frac{7}{16}$

(b) $6\frac{1}{3} - 3\frac{7}{12} = 3\frac{1}{3} - \frac{7}{12}$

$= 3\frac{4}{12} - \frac{7}{12}$

$= 2\frac{16}{12} - \frac{7}{12}$

$= 2\frac{9}{12}$

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

Practice

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

(a) $8 - 4\frac{1}{5}$ $3\frac{4}{5}$

(b) $12 - 7\frac{5}{16}$ $4\frac{11}{16}$

(c) $6\frac{1}{2} - 2\frac{3}{10}$ $4\frac{1}{5}$

(d) $7\frac{5}{8} - 4\frac{1}{3}$ $3\frac{2}{9}$

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

(f) $5\frac{1}{2} - 4\frac{5}{8}$ $\frac{7}{8}$

(g) $8\frac{1}{4} - 3\frac{7}{12}$ $4\frac{2}{3}$

(h) $10\frac{5}{12} - 3\frac{2}{3}$ $6\frac{3}{4}$

(i) $12 - 2\frac{5}{24} - 3\frac{1}{3}$ $6\frac{11}{24}$

(j) $14\frac{1}{2} - 6\frac{3}{4} - 1\frac{7}{8}$ $5\frac{7}{8}$

3 Eli had a board that was $9\frac{1}{2}$ m long. He cut off 2 pieces, one $3\frac{3}{10}$ m long and the other $2\frac{4}{5}$ m long. How long is the third piece of the board in meters?

$9\frac{1}{2} - 3\frac{3}{10} - 2\frac{4}{5} = 3\frac{2}{5}$

$3\frac{2}{5}$ meters

Exercise 7

Check

Express answers 1 or greater as whole or mixed numbers. Use simplest form.

1 Find the values.

(a) $\frac{5}{9} + \frac{2}{3}$ $1\frac{2}{9}$

(b) $6\frac{9}{12} + \frac{5}{12}$ $7\frac{1}{6}$

(c) $10\frac{1}{3} - 7\frac{2}{3}$ $2\frac{2}{3}$

(d) $8\frac{4}{5} + 1\frac{7}{15}$ $10\frac{4}{15}$

(e) $3\frac{5}{14} - \frac{4}{7}$ $2\frac{11}{14}$

(f) $5\frac{13}{16} - 2\frac{5}{8}$ $2\frac{8}{9}$

(g) $8\frac{1}{6} + \frac{7}{30} + 3\frac{1}{2}$ $11\frac{9}{10}$

(h) $5\frac{27}{28} - 2\frac{3}{7} - \frac{13}{14}$ $2\frac{17}{28}$

2 Complete each pattern by following the rule. Use whole or mixed numbers when possible, and simplest form.

(a) Add $\frac{2}{3}$.

$\frac{2}{9}, \frac{8}{9}, \boxed{1\frac{5}{9}}, \boxed{2\frac{2}{9}}, \boxed{2\frac{8}{9}}, \boxed{3\frac{5}{9}}, \boxed{4\frac{2}{9}}, \boxed{4\frac{8}{9}}$

(b) Subtract $\frac{3}{8}$.

$3\frac{1}{2}, 3\frac{1}{8}, \boxed{2\frac{3}{4}}, \boxed{2\frac{3}{8}}, \boxed{2}, \boxed{1\frac{5}{8}}, \boxed{1\frac{1}{4}}, \boxed{\frac{7}{8}}$

(c) Add $2\frac{5}{12}$.

$\frac{1}{2}, \boxed{2\frac{11}{12}}, \boxed{5\frac{1}{3}}, \boxed{7\frac{3}{4}}, \boxed{10\frac{1}{6}}, \boxed{12\frac{7}{12}}, \boxed{15}, \boxed{17\frac{5}{12}}$

(d) Subtract $1\frac{3}{4}$.

$30\frac{1}{2}, \boxed{28\frac{3}{4}}, \boxed{27}, \boxed{25\frac{1}{4}}, \boxed{23\frac{1}{2}}, \boxed{21\frac{3}{4}}, \boxed{20}, \boxed{18\frac{1}{4}}$

3 Evan spent $2\frac{2}{3}$ hours practicing the piano in the morning. He spent another $1\frac{2}{3}$ hours practicing in the afternoon. How many hours did he practice in all?

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

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

4 A railroad track-laying machine laid $1\frac{1}{5}$ km of track on Monday and $\frac{17}{20}$ km of track on Tuesday. How many more kilometers of track did it lay on Monday than on Tuesday?

$1\frac{1}{5} - \frac{17}{20} = \frac{7}{20}$

$\frac{7}{20}$ km

5 Package A weighs $4\frac{1}{2}$ pounds. Package B weighs $2\frac{1}{8}$ pounds more than Package A. What is the total weight of the two packages?

$4\frac{1}{2} + 2\frac{1}{8} + 4\frac{1}{2} = 11\frac{1}{8}$

$11\frac{1}{8}$ pounds

6 Catalina had $6\frac{3}{4}$ cups of flour. She used $2\frac{1}{2}$ cups of flour in one recipe and $2\frac{1}{4}$ cups of flour in another recipe. How much flour does she have left?

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

2 cups

Challenge

7 Write + or − in each ◯ to make each equation true.

(a) $\frac{13}{18} \bigcirc \frac{1}{9} \bigcirc \frac{1}{2} \bigcirc \frac{2}{3} = 1$

(b) $\frac{3}{4} \bigcirc \frac{13}{24} \bigcirc \frac{5}{8} \bigcirc \frac{1}{8} = 1$

8 This is a way to express 37 using five 3s and the addition symbol: $33 + 3 + \frac{3}{3}$.

(a) Use four 9s to express 100.

$99 + \frac{9}{9}$

(b) Use five 4s to express 55.

$44 + \frac{44}{4}$

(c) Use four 9s to express 20.

$9 + \frac{99}{9}$

(d) Use three each of 1, 3, 5, and 7 to express 20.

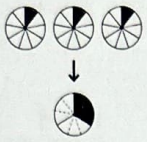
$1 + 3 + 5 + 7 + \frac{75}{75} + \frac{33}{11}$

Chapter 8 Multiplying a Fraction and a Whole Number

Exercise 1

Basics

1. Find the value of 3 groups of $\frac{1}{9}$.

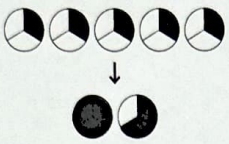


$3 \times \frac{1}{9} = \frac{3 \times 1}{9}$

$= \boxed{\frac{3}{9}}$

$= \boxed{\frac{1}{3}}$

2. Find the value of 5 groups of $\frac{1}{3}$.

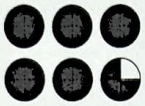


$5 \times \frac{1}{3} = \frac{5 \times 1}{3}$

$= \boxed{\frac{5}{3}}$

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

3. How many $\frac{1}{4}$s are in $5\frac{3}{4}$?



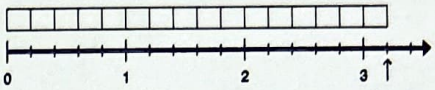
$5\frac{3}{4} = \boxed{\frac{23}{4}}$

$= \boxed{23} \times \frac{1}{4}$

There are 23 $\frac{1}{4}$s in $5\frac{3}{4}$.

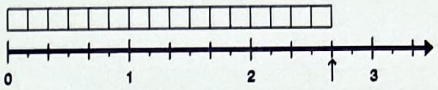
4. Express the products as mixed numbers in simplest form.

(a) Find the product of 16 and $\frac{1}{8}$.



$16 \times \frac{1}{8} = 3\frac{1}{5}$

(b) Find the product of 16 and $\frac{1}{8}$.



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

Practice

Express answers 1 or greater as whole or mixed numbers. Use simplest form.

5. Multiply.

(a) $5 \times \frac{1}{8}$ $\frac{5}{8}$

(b) $7 \times \frac{1}{12}$ $\frac{7}{12}$

(c) $5 \times \frac{1}{5}$ 1

(d) $8 \times \frac{1}{10}$ $\frac{4}{5}$

(e) $6 \times \frac{1}{3}$ 2

(f) $20 \times \frac{1}{4}$ 5

(g) $8 \times \frac{1}{5}$ $1\frac{3}{5}$

(h) $10 \times \frac{1}{8}$ $1\frac{1}{4}$

(i) $15 \times \frac{1}{9}$ $1\frac{2}{3}$

(j) $30 \times \frac{1}{18}$ 2

6. A jug has 4 L of juice. $\frac{1}{3}$ L of juice was poured into each of 10 glasses. How many liters of juice are still in the jug?

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

$4 - 3\frac{1}{3} = \frac{2}{3}$

$\frac{2}{3}$ L

Exercise 2 • pages 174–175

Exercise 2

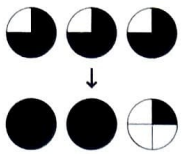
Basics

1 Find the value of 3 groups of $\frac{3}{4}$.

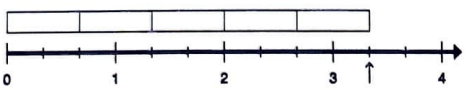
$3 \times \frac{3}{4} = \frac{3 \times 3}{4}$

$= \boxed{\frac{9}{4}}$

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



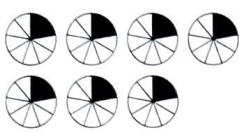
2 Find the product of 5 and $\frac{2}{3}$.



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

3 Find the product of 7 and $\frac{2}{9}$. Express the answer as a mixed number.

$7 \times \frac{2}{9}$ $\frac{14}{9} = 1\frac{5}{9}$



Practice

Express answers 1 or greater as whole or mixed numbers. Use simplest form.

4 Multiply.

(a) $2 \times \frac{3}{7}$ $\frac{6}{7}$

(b) $7 \times \frac{5}{12}$ $2\frac{11}{12}$

(c) $3 \times \frac{3}{5}$ $1\frac{4}{5}$

(d) $9 \times \frac{3}{10}$ $2\frac{7}{10}$

(e) $5 \times \frac{5}{8}$ $4\frac{1}{6}$

(f) $5 \times \frac{3}{7}$ $2\frac{1}{7}$

(g) $7 \times \frac{5}{11}$ $3\frac{2}{11}$

(h) $8 \times \frac{7}{15}$ $3\frac{11}{15}$

5 A park $1\frac{3}{5}$ miles from Carter's home has a trail around it that is $\frac{9}{10}$ mile long. Carter ran to the park, ran the trail 3 times, and then ran home. How far did he run in all?

$3 \times \frac{9}{10} = 2\frac{7}{10}$

$1\frac{3}{5} + 2\frac{7}{10} + 1\frac{3}{5} = 5\frac{9}{10}$

$5\frac{9}{10}$ miles

Exercise 3 • pages 176–178

Exercise 3

Basics

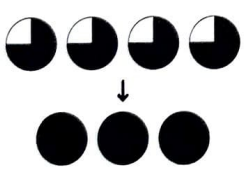
1 Find the value of 4 groups of $\frac{3}{4}$.

(a) $4 \times \frac{3}{4} = \frac{4 \times 3}{4}$

$= \boxed{\frac{12}{4}}$

$= \boxed{3}$

(b) $4 \times \frac{3}{4} = \frac{\overset{1}{\cancel{4}} \times 3}{\underset{1}{\cancel{4}}} = \boxed{3}$

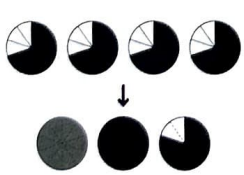


2 Find the value of 4 groups of $\frac{7}{10}$.

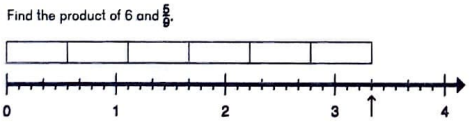
$4 \times \frac{7}{10} = \frac{\overset{2}{\cancel{4}} \times 7}{\underset{5}{\cancel{10}}}$

$= \boxed{\frac{14}{5}}$

$= \boxed{2\frac{4}{5}}$



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



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

Practice

Express answers 1 or greater as whole or mixed numbers. Use simplest form.

4 Multiply.

(a) $3 \times \frac{2}{9}$ $\frac{2}{3}$

(b) $8 \times \frac{3}{4}$ 6

(c) $15 \times \frac{2}{5}$ 6

(d) $3 \times \frac{5}{6}$ $2\frac{1}{2}$

(e) $8 \times \frac{3}{10}$ $2\frac{2}{5}$

(f) $10 \times \frac{3}{8}$ $3\frac{3}{4}$

(g) $15 \times \frac{4}{9}$ $6\frac{2}{3}$

(h) $15 \times \frac{5}{12}$ $6\frac{1}{4}$

5 One wall of Allysa's room is 3 m long. She is making a ceiling border for that wall by pasting $\frac{3}{10}$ m pieces of wallpaper trim end-to-end. So far she has pasted 9 pieces of trim. How long does she have to make the last piece of trim to complete the project?

$9 \times \frac{3}{10} = 2\frac{7}{10}$

$3 - 2\frac{7}{10} = \frac{3}{10}$

$\frac{3}{10}$ m

Challenge

6 Use the given digits so each expression has the greatest possible value. Express the answer as a mixed number in simplest form.

(a) 4, 5, 6 $\boxed{6} \times \boxed{\frac{5}{4}} = 7\frac{1}{2}$

(b) 6, 7, 8, 9 $\boxed{9} \times \boxed{\frac{8}{6}} + \boxed{7} = 19$

The least digit should be the denominator of the fraction. Otherwise, expressions may vary (for example (a) could be $5 \times \frac{6}{4}$).

7 Use the given digits so each expression has the least possible value. Express the answer as a mixed number in simplest form.

(a) 4, 5, 6 $\boxed{4} \times \boxed{\frac{5}{6}} = 3\frac{1}{3}$

(b) 6, 7, 8, 9 $\boxed{8} \times \boxed{\frac{7}{9}} + \boxed{6} = 12\frac{2}{9}$

The greatest digit should be the denominator of the fraction.

Exercise 4 • pages 179–181

Exercise 4

Basics

1 

__2__ out of 5 children are boys.

$\frac{2}{5}$ of the children are boys.

__3__ out of 5 children are girls.

$\frac{3}{5}$ of the children are girls.

2 

(a) __9__ out of 21 coins are pennies.

$\frac{9}{21}$ of the coins are pennies.

__3__ out of 7 groups of coins are pennies.

$\frac{3}{7}$ of the coins are pennies.

(b) What fraction of the coins are nickels? Express the answer in simplest form.

$\frac{4}{7}$

Practice

Express all answers in simplest form.

3 What fraction of each set of stars is shaded?

(a)  $\frac{2}{7}$

(b)  $\frac{1}{5}$

(c)  $\frac{3}{3}$

(d)  $\frac{4}{4}$

(e)  $\frac{1}{2}$

(f)  $\frac{3}{3}$

(g)  $\frac{3}{4}$

(h)  $\frac{5}{5}$

4 

$\frac{1}{6}$ of the shapes are squares. $\frac{1}{2}$ of the shapes are triangles.

$\frac{1}{3}$ of the shapes are circles. $\frac{2}{3}$ of the shapes have straight sides.

5 There are 15 Mongolian gerbils and 6 fat-tailed gerbils for sale at a pet store.

(a) What fraction of the gerbils are Mongolian gerbils?

$\frac{5}{7}$

(b) What fraction of the gerbils are fat-tailed gerbils?

$\frac{2}{7}$

6 Victoria has 30 pennies, 15 nickels, and 45 dimes.

(a) What fraction of her coins are pennies?

$\frac{1}{3}$

(b) What fraction of her coins are nickels?

$\frac{1}{6}$

(c) What fraction of her coins are dimes?

$\frac{1}{2}$

Exercise 5 • pages 182–184

Exercise 5

Basics

1 There are 15 stars.

(a) $\frac{1}{5}$ of the stars are shaded.

$\frac{1}{5}$ of 15 → $\frac{15}{5}$ = 3

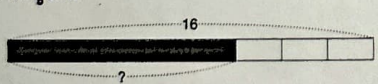
$\frac{1}{5} \times 15 = \frac{1 \times \overset{3}{\cancel{15}}}{\underset{1}{\cancel{5}}} = 3$

(b) $\frac{4}{5}$ of the stars are shaded.

$\frac{4}{5}$ of 15 → $4 \times \frac{15}{5}$ = 12

$\frac{4}{5} \times 15 = \frac{4 \times \overset{3}{\cancel{15}}}{\underset{1}{\cancel{5}}} = 12$

2 Find $\frac{5}{8}$ of 16.



(a) 8 units → 16

1 unit → $\frac{16}{8}$ = 2

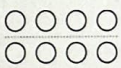
5 units → 5 × 2 = 10

(b) $\frac{5}{8} \times 16 = \frac{5 \times \overset{2}{\cancel{16}}}{\underset{1}{\cancel{8}}} = 10$

Practice

Express all answers in simplest form.

3 (a) $\frac{1}{2}$ of 8 → $\frac{1}{2} \times 8$ = 4



(b) $\frac{1}{3}$ of 6 → $\frac{1}{3} \times 6$ = 2

$\frac{2}{3}$ of 6 → $\frac{2}{3} \times 6$ = 4

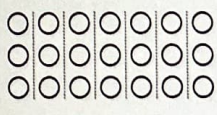
(c) $\frac{1}{8}$ of 12 → $\frac{1}{8} \times 12$ = 2

$\frac{5}{8}$ of 12 → $\frac{5}{8} \times 12$ = 10

(d) $\frac{1}{7} \times 21$ = 3

$\frac{3}{7} \times 21$ = 9

$\frac{5}{7} \times 21$ = 15

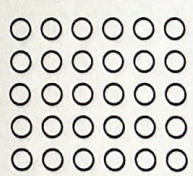


(e) $\frac{1}{2} \times 30$ = 15

$\frac{3}{5} \times 30$ = 18

$\frac{5}{6} \times 30$ = 25

$\frac{7}{10} \times 30$ = 21



4 Find the value of each of the following.

(a) $\frac{1}{2} \times 16$ 8

(b) $\frac{3}{4} \times 12$ 9

(c) $\frac{2}{5} \times 100$ 40

(d) $\frac{1}{9} \times 180$ 20

(e) $\frac{2}{3} \times 60$ 40

(f) $\frac{3}{8} \times 56$ 21

(g) $\frac{2}{3} \times 48$ 32

(h) $\frac{7}{10} \times 120$ 84

5 A dog has 42 teeth. $\frac{2}{7}$ of a dog's teeth are incisors, which are used for tearing meat from bones and for self-grooming. How many incisors does a dog have?

$42 \times \frac{2}{7} = 12$

12 incisors

Exercise 6 • pages 185–187

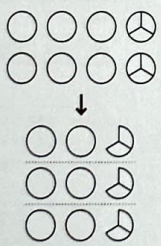
Exercise 6

Basics

1 (a) Find $\frac{1}{3}$ of 8.

$\frac{1}{3} \times 8 = \frac{8}{3}$

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



(b) Find $\frac{2}{3}$ of 8.

$\frac{2}{3} \times 8 = \frac{2 \times 8}{3}$

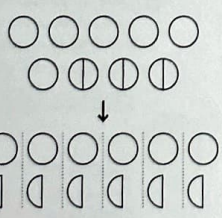
$= \frac{16}{3}$

$= 5\frac{1}{3}$

2 (a) Find $\frac{1}{6}$ of 9.

$\frac{1}{6} \times 9 = \frac{3}{\cancel{9}_{6}}$

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



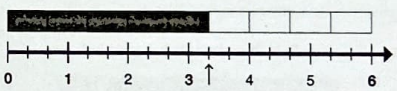
(b) Find $\frac{5}{6}$ of 9.

$\frac{5}{6} \times 9 = \frac{5 \times \cancel{9}^{3}}{\cancel{6}_{2}}$

$= \frac{15}{2}$

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

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

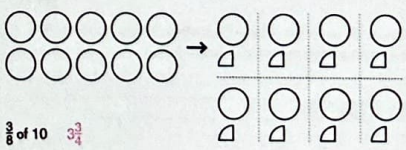


$\frac{5}{9} \times 6 = \frac{5 \times \cancel{6}^{2}}{\cancel{9}_{3}} = 3\frac{1}{3}$

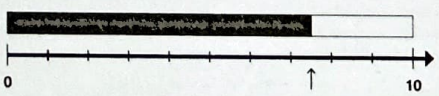
Practice

Express answers 1 or greater as whole or mixed numbers. Use simplest form.

4 Find the value of each of the following.

(a) 

$\frac{3}{8}$ of 10 $3\frac{3}{4}$

(b) 

$\frac{3}{4}$ of 10 $7\frac{1}{2}$

5 Find the value of each of the following.

(a) $\frac{1}{2}$ of 9 $4\frac{1}{2}$

(b) $\frac{1}{3}$ of 10 $3\frac{1}{3}$

(c) $\frac{2}{9} \times 4$ $\frac{8}{9}$

(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) $\frac{7}{10} \times 15$ $10\frac{1}{2}$

6 Does $\frac{5}{8}$ of a 12 lb bag of beans weigh more or less than twelve $\frac{5}{8}$ lb bags of beans?

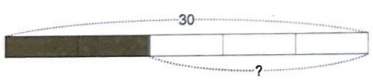
They weigh the same.

Exercise 7 • pages 188–191

Exercise 7

Basics

1 A cat has 30 teeth. If $\frac{2}{5}$ of a cat's teeth are incisors, how many teeth are not incisors?



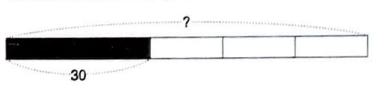
5 units → 30

1 unit → $\frac{30}{5} = 6$

3 units → $3 \times 6 = 18$

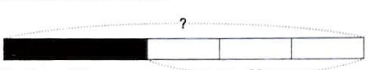
18 teeth

2 $\frac{2}{5}$ of Asimah's books are nonfiction. The rest are fiction. If she has 30 nonfiction books, how many books does she have?



2 units → 30
1 unit → $\frac{30}{2} = 15$
5 units → $5 \times 15 = 75$ 75 books

3 A water tank is $\frac{2}{5}$ full. It takes another 30 gallons to fill it up. How many gallons of water does the tank hold?

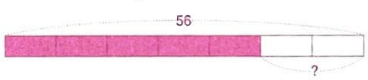


3 units → 30
1 unit → $\frac{30}{3} = 10$
5 units → $5 \times 10 = 50$

50 gallons

Practice Methods may vary.

4 There are 56 members in a paddling club. $\frac{5}{7}$ of them are adults and the rest are children. How many children are in the club?



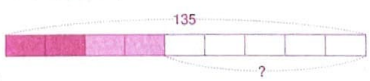
7 units → 56
1 unit → $56 \div 7 = 8$
2 units → $8 \times 2 = 16$

or

$1 - \frac{5}{7} = \frac{2}{7}$
$\frac{2}{7} \times 56 = 16$

16 children

5 There are 135 helium balloons at a party. $\frac{2}{9}$ of them are blue. There are as many red balloons as blue balloons. The rest of the balloons are yellow. How many balloons are yellow?



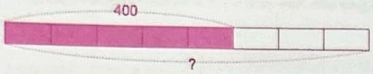
9 units → 135
1 unit → $135 \div 9 = 15$
5 units → $5 \times 15 = 75$

or

$1 - \frac{2}{9} - \frac{2}{9} = \frac{5}{9}$
$\frac{5}{9} \times 135 = 75$

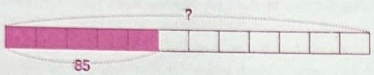
75 yellow balloons

6 Gary traveled by train for 400 miles of his trip. He took a bus for the remaining $\frac{3}{8}$ of the trip. How many miles was his trip?



5 units ⟶ 400
1 unit ⟶ 400 ÷ 5 = 80
8 units ⟶ 80 × 8 = 640
640 miles

7 Lee made a brick mailbox using two colors of bricks. $\frac{5}{12}$ of the bricks were light red and the rest were dark red. If he used 85 light red bricks, how many bricks did he use in all?



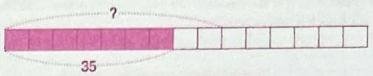
5 units ⟶ 85
1 unit ⟶ 85 ÷ 5 = 17
12 units ⟶ 12 × 17 = 204
204 bricks

Challenge

8 After $\frac{3}{5}$ of a bag of flour was used to make bread, there were 9 kg of flour left. How many kilograms of flour were in the bag at first?

2 units ⟶ 9
1 unit ⟶ 9 ÷ 2 = $4\frac{1}{2}$
5 units ⟶ 5 × $4\frac{1}{2}$ = $22\frac{1}{2}$
$22\frac{1}{2}$ kg

9 If $\frac{7}{15}$ of a number is 35, what is $\frac{3}{5}$ of the number?



$\frac{3}{5} = \frac{9}{15}$
7 units ⟶ 35
1 unit ⟶ 35 ÷ 7 = 5
9 units ⟶ 9 × 5 = 45
45

Exercise 8 • pages 192–195

Exercise 8

Basics

1 Anna spent 21 days on a vacation. 14 of them were spent at the beach and the remaining days were spent hiking in the mountains. What fraction of her vacation was spent in the mountains?

21 − 14 = 7

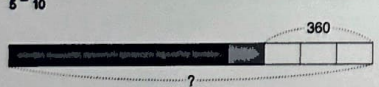
7 out of 21 days were spent in the mountains.

$\frac{7}{21} = \frac{1}{3}$

$\frac{1}{3}$ of her vacation was spent in the mountains.

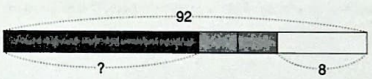
2 On the way home from the park, Jody ran for $\frac{3}{5}$ of the way, jogged for $\frac{1}{10}$ of the way, and walked the remaining 360 m. How far was the park from her home in meters?

$\frac{3}{5} = \frac{6}{10}$



3 units ⟶ 360
1 unit ⟶ 360 ÷ 3 = 120
10 units ⟶ 10 × 120 = 1,200
1,200 m

3 Fadiya had 92 tropical fish. She gave 8 of them to her friend, and then sold $\frac{2}{7}$ of the remaining fish. How many fish does she have now?



7 units ⟶ 92 − 8 = 84
1 unit ⟶ 84 ÷ 7 = 12
5 units ⟶ 5 × 12 = 60
60 fish

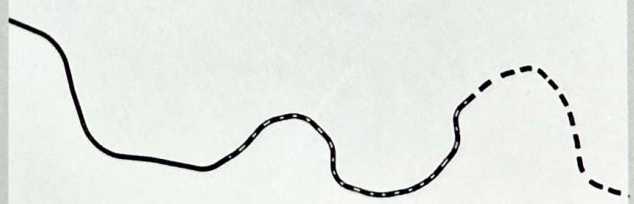
Practice

1 Jack is driving from town to his farm 36 miles away. 25 miles of the road are paved, 7 miles are gravel, and the remaining miles are dirt. What fraction of the trip is on a dirt road?

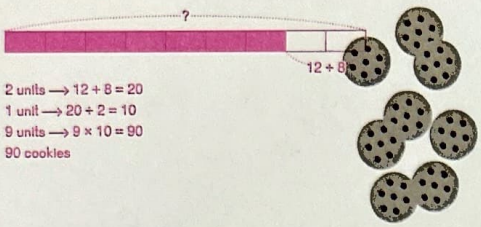
36 − 25 − 7 = 4

$\frac{4}{36} = \frac{1}{9}$

$\frac{1}{9}$ of the trip

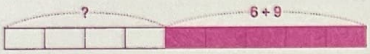


5 Aurora baked some cookies. She gave 12 cookies to her family, and then sold $\frac{7}{9}$ of the cookies at a bake sale. She had 8 cookies left over. How many cookies did she bake?



2 units ⟶ 12 + 8 = 20
1 unit ⟶ 20 ÷ 2 = 10
9 units ⟶ 9 × 10 = 90
90 cookies

6 On a math team, 6 students are from the third grade, 9 students are from the fourth grade, and $\frac{4}{9}$ of the students are from the fifth grade. How many students are from the fifth grade?



5 units ⟶ 6 + 9 = 15
1 unit ⟶ 15 ÷ 5 = 3
4 units ⟶ 4 × 3 = 12
12 students

7 Land area is measured in acres. On a farm, $\frac{1}{12}$ of the land is used to grow clover, $\frac{1}{4}$ is used to grow wheat, $\frac{1}{3}$ is used to grow rye, and the remaining 8 acres is used to grow oats. How many acres is the land that is being planted?

4 units ⟶ 8
1 unit ⟶ 8 ÷ 4 = 2
12 units ⟶ 12 × 2 = 24
24 acres

Challenge

8 There are twelve flags spaced equally along a track. Runners start at the first flag. A runner reaches the 8th flag in 8 seconds. If he runs the whole time at the same speed, in how many seconds will he reach the 11th flag?

There are 7 intervals from the 1st to the 8th flag, and 10 from the 1st flag to the 11th flag. So he ran each segment in $\frac{8}{7}$ seconds, and 10 segments in $10 \times \frac{8}{7} = \frac{80}{7} = 11\frac{3}{7}$ seconds.

$11\frac{3}{7}$ seconds

Exercise 9 • pages 196–200

Exercise 9

Check

Express answers 1 or greater as whole or mixed numbers. Use simplest form.

1 Multiply.

(a) $15 \times \frac{1}{5}$ 3

(b) $12 \times \frac{2}{3}$ 8

(c) $6 \times \frac{5}{9}$ $3\frac{1}{3}$

(d) $4 \times \frac{7}{30}$ $\frac{14}{15}$

(e) $\frac{3}{5} \times 10$ 6

(f) $\frac{7}{8} \times 40$ 35

(g) $\frac{3}{7} \times 8$ $3\frac{3}{7}$

(h) $\frac{13}{20} \times 480$ 312

2 (a) $24 \times \boxed{\frac{1}{3}} = 8$

(b) $36 \times \boxed{\frac{1}{4}} = 9$

3 A nail is $\frac{5}{8}$ inches long. How many inches are 7 nails placed end-to-end?

$7 \times \frac{5}{8} = 4\frac{3}{8}$

$4\frac{3}{8}$ inches

4 Because of the lower gravity of the moon, a person weighs about $\frac{4}{25}$ as much on the moon as on Earth. About how much would a 75 pound person weigh on the moon?

$75 \times \frac{4}{25} = 12$
12 pounds

5 Because of the lower gravity of Mars, a person who weighs 200 pounds on Earth would weigh 76 pounds on Mars.

(a) A weight on Mars is what fraction of a weight on Earth?

$\frac{76}{200} = \frac{19}{50}$

$\frac{19}{50}$

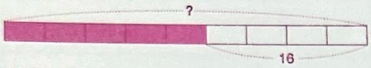
(b) How much would a 75 pound person weigh on Mars?

$75 \times \frac{19}{50} = 28\frac{1}{2}$

$28\frac{1}{2}$ pounds

6 There are some balloons at a party. $\frac{2}{9}$ of the balloons are black, $\frac{1}{3}$ of them are orange, and the remaining 16 balloons are yellow. How many balloons are there?

$\frac{1}{3} = \frac{3}{9}$



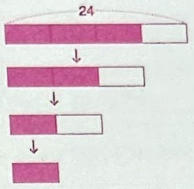
4 units ⟶ 16
1 unit ⟶ 16 ÷ 4 = 4
9 units ⟶ 4 × 9 = 36
36 balloons

7 On a farm, there are 60 sheep. 16 are Leicester sheep. There are twice as many Merino sheep as Leicester sheep. The rest are Dorset sheep. What fraction of the sheep are Dorset sheep?

Merino: 2 × 16 = 32
Dorset: 60 − 32 − 16 = 12
$\frac{12}{60} = \frac{1}{5}$

$\frac{1}{5}$ of the sheep

8 Amelia has 24 toy cars. She gave $\frac{3}{4}$ of her cars to Carter. Carter gave $\frac{2}{3}$ of the cars he got from Amelia to Eli. Eli gave $\frac{1}{2}$ of the cars he got from Carter to Grace. How many cars did Grace get from Eli?



24 ÷ 4 = 6
6 cars

9 A chess club has a tournament once a month. Last month, $\frac{3}{4}$ of the members attended the tournament. This month, $\frac{3}{8}$ of the members did not attend the tournament. If there were 24 members that did not attend the tournament this month, how many members were at the tournament last month?

$\frac{3}{4} = \frac{6}{8}$

3 units ⟶ 24
6 units ⟶ 2 × 24 = 48

or

1 unit ⟶ $\frac{24}{3}$ = 8
6 units ⟶ 6 × 8 = 48

48 members

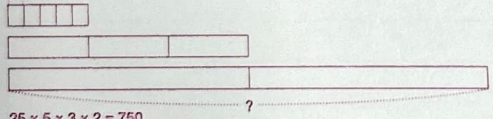
Challenge

10 8 stakes are spaced evenly apart in a garden. If the distance between two of them is $\frac{4}{7}$ m, how many meters is the distance from the first stake to the last stake?

There are 7 intervals.
$7 \times \frac{4}{7} = 4$
4 meters

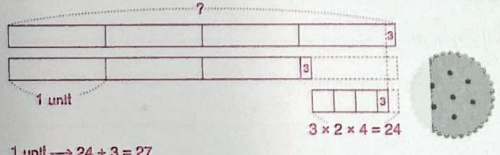
11 $\frac{1}{5}$ of $\frac{1}{3}$ of $\frac{1}{2}$ of a number is 25. What is the number?

25



25 × 5 × 3 × 2 = 750
750

12 Jordan ate $\frac{3}{4}$ of the rice crackers in a package plus another 3 crackers. Adam then ate $\frac{3}{4}$ of the remaining crackers and another 3 crackers. If there were 3 crackers left, how many crackers were in the package at first?



1 unit ⟶ 24 ÷ 3 = 27
4 units ⟶ 4 × 27 = 108
108 crackers

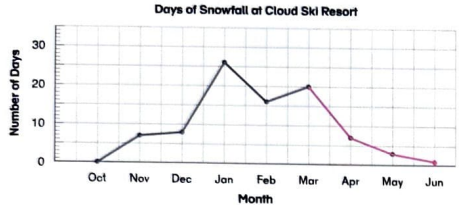
Chapter 9 Line Graphs and Line Plots

Exercise 1

Basics

1 This table shows the number of days it snowed each month from October to June at Cloud Ski Resort. A graph of the same data is partially completed.

Month	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Number of Days of Snow	0	7	8	26	16	20	7	3	1



(a) Complete the graph.

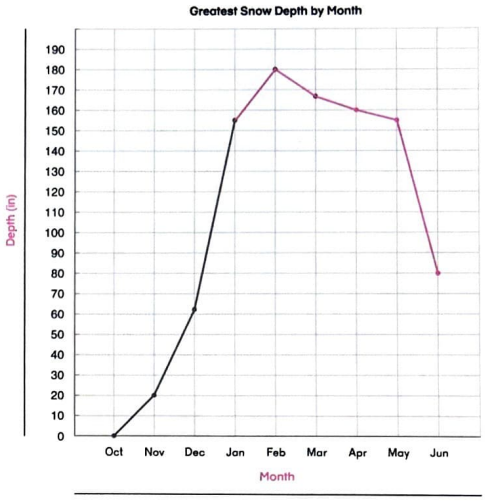
(b) Which three months had the most days of snowfall?
January, February, March

(c) The greatest change in the number of days of snowfall was between which two months? Was this change an increase or a decrease?
December to January; Increase

Practice

2 This table shows the greatest snow depth, in inches, each month from October to June at a ski resort. A graph of the same data is partially completed.

Month	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Depth (in)	0	20	63	155	180	168	160	155	80



(a) Plot the rest of the points and connect them with lines.

(b) What does the vertical axis represent? Label it.
Depth of snow in inches

(c) What does the horizontal axis represent? Label it.
Month

(d) How many inches does each increment between tick marks represent?
10 inches

(e) In which month was the snow the deepest?
February

(f) Between which two months was the sharpest increase in snow depth?
December to January

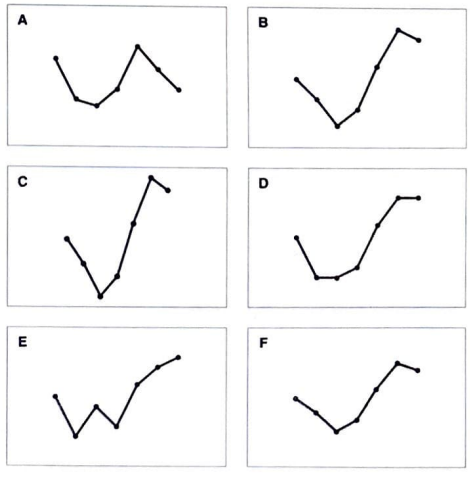
(g) By how many inches did the snow depth fall between January and June?
75 inches

(h) Which months might be the best time to plan a ski trip when there is fresh snow?
December or January

3 This table shows the number of people that visited a museum each day for one week.

Day	Mon	Tues	Wed	Thur	Fri	Sat	Sun
Number of People	35	25	12	20	42	60	55

Which three of the following graphs could be accurate representations of the data? B, C, and F. Scales differ on each of them.



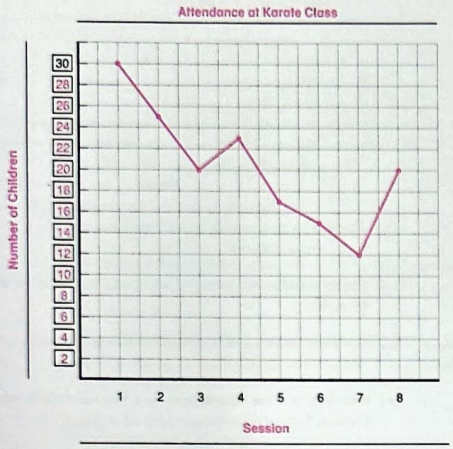
Exercise 2

Basics

1 The following table shows the number of children each week at the 8 sessions of a karate class.

Session	1	2	3	4	5	6	7	8
Number of Children	30	25	20	23	17	15	12	20

Complete the graph below to show this information. Title may vary.



Practice

2 Misha recorded the weight of her Shih Tzu puppy, Sofie, every 2 weeks for the first 36 weeks. The data is shown in the table below.

Weeks	Weight (Ounces)
Birth	6
2	16
4	24
6	29
8	39
10	45
12	53
14	60
16	70
18	74
20	81
22	86
24	93
26	95
28	96
30	98
32	99
34	98
36	98

(a) Complete the line graph on the next page. Include a title, label the axes, and label the increments.

(b) At about how many weeks did Sofie's growth rate start slowing down?
24 weeks

(c) At about how many weeks old was Sofie full grown?
30 weeks

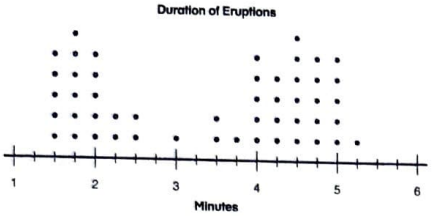
(d) From the graph, estimate Sofie's weight at 17 weeks.
72 ounces

(e) What would be an expected weight for Sofie at 1 year?
around 98 ounces

Exercise 3

Basics

1 A visitor at Yellowstone National Park recorded the duration of the eruptions of the Old Faithful Geyser to the nearest fourth of a minute.



(a) How many eruptions did he record?
50

(b) The eruptions lasted from $1\frac{1}{2}$ minutes to $5\frac{1}{4}$ minutes.

(c) Which two time durations were most of the eruptions?
$1\frac{3}{4}$ minutes and $4\frac{1}{2}$ minutes

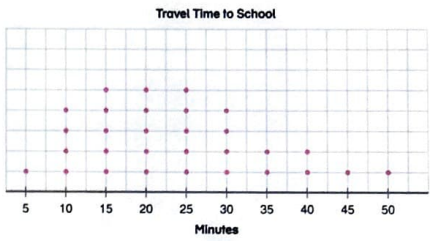
(d) How many time durations were less than $3\frac{1}{4}$ minutes long?
21

Practice

2 Jaiden asked some students how long it took them to get to school, rounded to the nearest 5 minutes, and listed their answers.

10	20	5	25	15	10	30	15	25	20	25	40	30	15	35
20	25	35	15	30	20	40	10	30	15	10	50	45	20	25

(a) Use this data to complete the line plot below.



(b) What are the most common travel times?
15, 20, and 25 minutes

(c) What is the difference between the longest and shortest travel times?
45 minutes

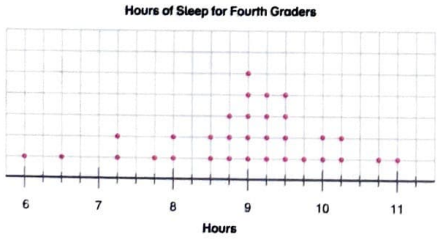
(d) How many students took less than half an hour to travel to school?
20

(e) What fraction of the students took more than half an hour to travel to school?
$\frac{1}{5}$

3 The students in a fourth grade class were asked to write down the number of hours they slept to the nearest fourth of an hour.

9	$8\frac{3}{4}$	6	$9\frac{1}{4}$	$8\frac{3}{4}$	8	$7\frac{1}{4}$	$9\frac{1}{4}$
$9\frac{1}{2}$	10	$9\frac{1}{2}$	$6\frac{1}{2}$	$9\frac{1}{2}$	9	$9\frac{1}{4}$	$10\frac{1}{4}$
9	$7\frac{1}{4}$	8	$8\frac{1}{2}$	9	$7\frac{3}{4}$	9	11
10	$9\frac{1}{4}$	$8\frac{1}{2}$	$8\frac{3}{4}$	$10\frac{1}{4}$	$9\frac{3}{4}$	$9\frac{1}{2}$	$10\frac{3}{4}$

(a) Complete the line plot below.



(b) How many students are included in the data set?
32 students

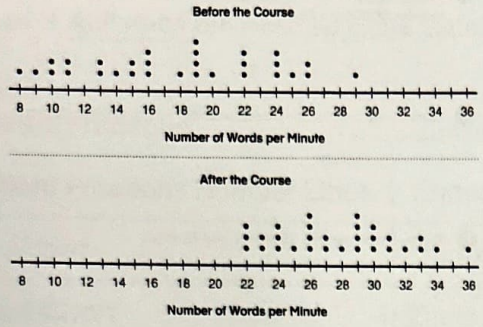
(c) It is recommended that children between 6 and 13 years old get at least 9 hours of sleep. How many students did not get at least 9 hours of sleep?
12 students

(d) What fraction of the students got at least 9 hours of sleep?
$\frac{5}{8}$

Exercise 4

Check

1 A teacher recorded the number of words some students could type before and after a keyboarding class. These two line plots show the two data sets.



(a) How many students were in the class?
30 students

(b) What was the difference between the least and the greatest number of words students could type in one minute at the beginning of the course?
21 words per minute

(c) What was the difference between the least and the greatest number of words students could type in one minute at the end of the course?
14 words per minute

(d) Based on the data, was the class helpful? Explain.
The class was helpful. Answers will vary. It is not possible to determine from this data whether all students improved, but most of them did.

2 Jacob's and Sara's heights to the nearest inch was recorded on their birthdays every year from ages 2 to 20. The data is shown in the table below. On the next page, Jacob's data has been graphed. The vertical axis below 30 has been shortened since there are no data values for height less than 30.

	Height (in)	
Age (years)	Jacob	Sara
2	35	31
3	37	33
4	40	36
5	41	39
6	45	44
7	46	47
8	49	51
9	50	53
10	53	56
11	55	57
12	57	62
13	60	63
14	62	64
15	65	64
16	66	64
17	69	64
18	70	65
19	71	65
20	71	65

(a) Write a title and label the axes on the graph.

(b) Use a different color to graph the data for Sara. Indicate which line is for which person.

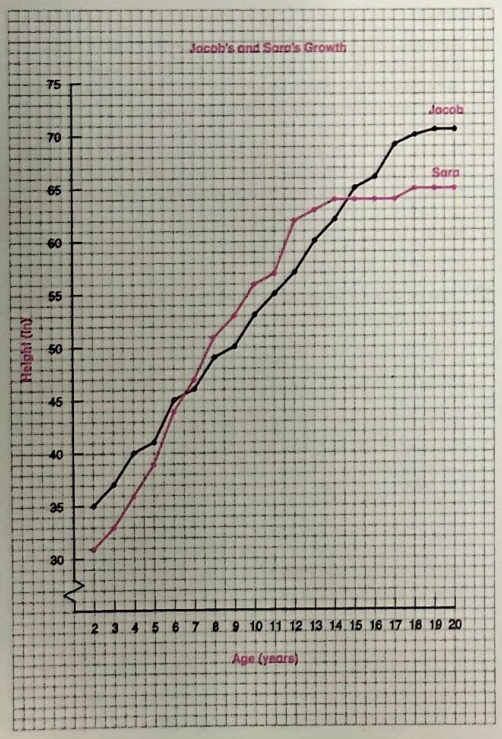
(c) From the graph, estimate Jacob's height when he was $3\frac{1}{2}$ years old.
38 inches

(d) From the graph, estimate Sara's height when she was $11\frac{1}{2}$ years old.
60 inches

(e) At about what age did Sara stop growing as quickly?
About 12 years

(f) At about what age did Jacob stop growing as quickly?
About 17 years

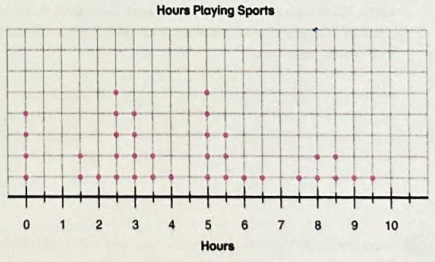
(g) What other observations can you make from the data?
Answers will vary. Examples: Sara was shorter to start with, grew more quickly than Jacob and so was taller at the same age for a while, but stopped growing sooner and by age 20 was shorter than Jacob.



3 The following data shows the number of hours a week, to the nearest half hour, that some children spent playing organized sports.

$2\frac{1}{2}$	0	$1\frac{1}{2}$	5	0	2	$5\frac{1}{2}$	3	0
$9\frac{1}{2}$	$2\frac{1}{2}$	$8\frac{1}{2}$	$2\frac{1}{2}$	$3\frac{1}{2}$	8	5	$1\frac{1}{2}$	$5\frac{1}{2}$
$8\frac{1}{2}$	0	5	$3\frac{1}{2}$	8	3	6	4	3
3	$6\frac{1}{2}$	$2\frac{1}{2}$	9	5	$5\frac{1}{2}$	$2\frac{1}{2}$	$7\frac{1}{2}$	5

(a) Complete the line plot below.



(b) What were the two most common times spent playing sports?
$2\frac{1}{2}$ and 5 hours

(c) What fraction of the students did not play any organized sports?
$\frac{1}{9}$

(d) What fraction of the students played sports for more than 5 hours?
$\frac{1}{3}$

Exercise 5

Check

1. Write the numbers in order from least to greatest.

(a) $\frac{7}{9}, \frac{13}{18}, \frac{3}{7}, \frac{15}{13}, \frac{8}{21}$

$\frac{8}{21}, \frac{3}{7}, \frac{13}{18}, \frac{7}{9}, \frac{15}{13}$

(b) $\frac{43}{7}, \frac{31}{5}, \frac{63}{8}, \frac{49}{9}$

$\frac{49}{9}, \frac{43}{7}, \frac{31}{5}, \frac{63}{8}$

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

(a) $3\frac{7}{12} - \frac{2}{3}$ $2\frac{11}{12}$

(b) $\frac{5}{8} + \frac{3}{4} + \frac{1}{2}$ $1\frac{7}{8}$

(c) $4\frac{1}{2} + 16\frac{5}{6}$ $21\frac{1}{3}$

(d) $7\frac{1}{9} - 5\frac{2}{3}$ $1\frac{4}{9}$

(e) $12 \times \frac{5}{9}$ $6\frac{2}{3}$

(f) $\frac{7}{8} \times 10$ $8\frac{3}{4}$

(g) $\frac{2}{7}$ of 98 28

(h) $39 \div 6$ $6\frac{1}{2}$

3. Find three common multiples of 2, 3, and 4 greater than 60 but less than 100.

The least common multiple of 2, 3, and 4 is 12. So the common multiples are multiples of 12.

72, 84, 96

Answers may vary.

4. Estimate and then find the quotient and remainder when the difference between 35,004 and 28,683 is divided by 6.

$6{,}321 \div 6$ is 1,053 R 3.

5. Estimate and then find the product when the sum of 4,789 and 589 is multiplied by 35.

$5{,}378 \times 35 = 188{,}230$

6. Victoria has 30 pennies, 15 nickels, and 45 dimes.

(a) What fraction of her coins have a value of more than 1 cent?

$\frac{60}{90} = \frac{2}{3}$

(b) If she is given 10 quarters, what fraction of her coins will have a value less than 10 cents?

$\frac{45}{100} = \frac{9}{20}$

7. A jewelry store had 60 necklaces. They sold $\frac{3}{5}$ of them for \$459 each and the rest for \$295 each. How much did they receive from the sales?

$\frac{3}{5} \times 60 \times 459 = 16{,}524$ $\frac{2}{5} \times 60 \times 295 = 7{,}080$

$16{,}524 + 7{,}080 = 23{,}604$

\$23,604

8. For an art project, Amy cut a 30 ft piece of yarn into different sized pieces. 10 pieces were $\frac{7}{12}$ ft long and 18 pieces were $\frac{3}{4}$ ft long. How long is the leftover piece of yarn in feet?

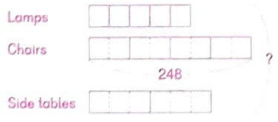
$10 \times \frac{7}{12} = 5\frac{5}{6}$

$18 \times \frac{3}{4} = 13\frac{1}{2}$

$30 - 5\frac{5}{6} - 13\frac{1}{2} = 10\frac{2}{3}$

$10\frac{2}{3}$ ft

9. Mr. Ikeda bought 5 identical lamps, 4 identical chairs, and 2 identical side tables. Each lamp cost half as much as each chair. Each side table cost the same as a lamp and chair combined. If he spent \$248 on the chairs, how much did he spend in all?



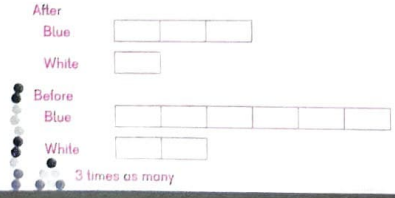
8 units ⟶ 248

1 unit ⟶ $248 \div 8 = 31$

19 units ⟶ $19 \times 31 = 589$

\$589

10. Avery had some blue and white beads. She used half of each type of bead. Then she had 3 times as many blue beads as white beads. How many times as many blue beads as white beads did she have at first?



Challenge

11. Aaron rolls a die. Every time he rolls a prime number, he gets 5 points. Every time he does not roll a prime number, he loses 3 points. At the end of the game, his score is 0. What is the least number of rolls he could have made? (Hint: The points he won and lost must be the same.)

Multiples of 5: 5, 10, 15

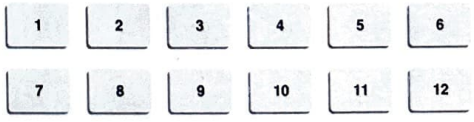
Multiples of 3: 3, 6, 9, 12, 15

Since 15 is the least common multiple, he would have rolled a prime number 3 times and would not have rolled a prime number 5 times.

$3 + 5 = 8$

8 rolls

12. There are 12 cards numbered 1–12. Alex, Dion, Mei, Emma, and Sofia each pick 2 cards and find the sum of the two cards they picked.



Alex	Dion	Mei	Emma	Sofia
16	4	19	11	7
6, 10	1, 3	8, 11	4, 7	2, 5

Which 2 cards did each friend pick?

Alex: $4 + 12 = 16$, $5 + 11 = 16$, $6 + 10 = 16$, $7 + 9 = 16$

Dion: $1 + 3 = 4$

Mei: $7 + 12 = 19$, $8 + 11 = 19$, $9 + 10 = 19$

Emma: $1 + 10 = 11$, $2 + 9 = 11$, $3 + 8 = 11$, $4 + 7 = 11$, $5 + 6 = 11$

Sofia: $1 + 6 = 7$, $2 + 5 = 7$, $3 + 4 = 7$

Dion had to have picked 1 and 3. So Sofia had to have picked 2 and 5.

1, 2, 3 and 5 have been picked, so Emma must have picked 4 and 7.

1, 2, 3, 4, 5, and 7 have been picked, so Alex must have picked 6 and 10.

The only ones left that Mei could have picked are 8 and 11.

