Scheme of Work

Week		TB	WB	Guide
1	**Chapter 8 Multiplying and Dividing by 6, 7, 8, and 9**			1–7
	Chapter Opener	1		8–9
	1 The Multiplication Table of 6	2–6	1–3	10–11
	2 The Multiplication Table of 7	7–11	4–6	12
	3 Multiplying by 6 and 7	12–13	7–9	13
	4 Dividing by 6 and 7	14–16	10–12	14
2	5 Practice A	17	13–16	15
	6 The Multiplication Table of 8	18–22	17–19	16
	7 The Multiplication Table of 9	23–26	20–22	17
	8 Multiplying by 8 and 9	27–28	23–25	18
	9 Dividing by 8 and 9	29–30	26–28	19
3	10 Practice B	31–32	29–32	20
	Workbook Chapter 8 Answers			21–30
	Dimensions Math® Tests 3B, Chapter 8, pp. 1–12			
	Chapter 9 Fractions — Part 1			31–34
	Chapter Opener	33		35
	1 Fractions of a Whole	34–38	33–36	36–37
4	2 Fractions on a Number Line	39–42	37–39	38
	3 Comparing Fractions with Like Denominators	43–46	40–42	39
	4 Comparing Fractions with Like Numerators	47–50	43–46	40
	5 Practice	51–52	47–50	41

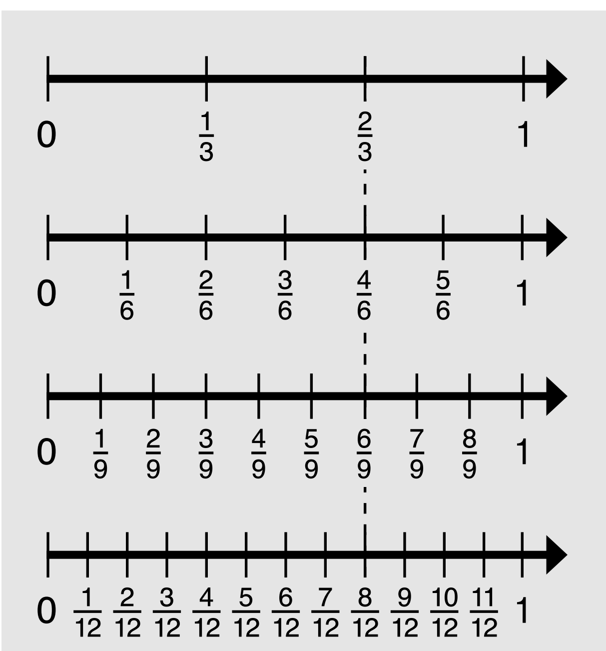
Notes

Equivalent Fractions

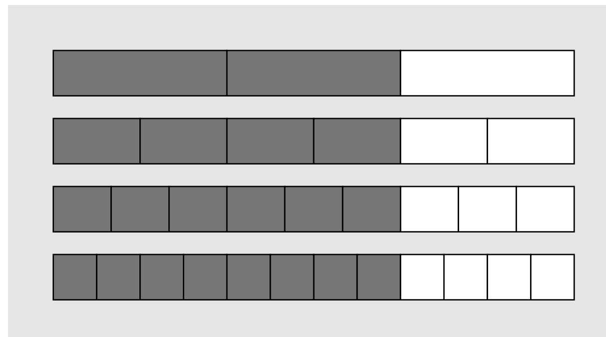
In this chapter, students will understand and find equivalent fractions, find the simplest form of a fraction, and use equivalent fractions as another strategy for comparing and ordering fractions.

Fractions are equal, or "equivalent," if they have the same value; that is, they represent the same number. Students already know that fractions with the same numerator and denominator are equal; they all have a value of 1. They also may already have an intuitive understanding of some equivalent fractions, from seeing fractions on a shape or number line, such as $\frac{1}{2} = \frac{2}{4}$.

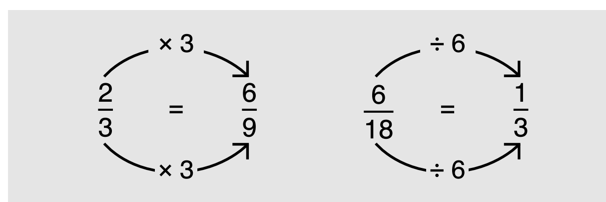
Number lines are used to visualize equivalent fractions. On a number line, equivalent fractions are located at the same point. If the number lines are shown separately for each fraction, the distance to 1 is the same on each number line.



Bar models are also used to visualize equivalent fractions. Since students will be using bar models to interpret and solve fraction word problems involving fractions later, it is important that they are familiar with representing equivalent fractions with bar models.



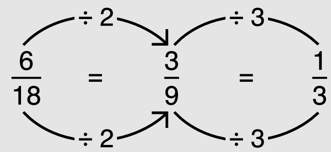
To find an equivalent fraction, we can multiply or divide the numerator or denominator by the same number.



Students will see problems where they need to fill in a missing numerator or denominator. They can solve a problem such as $\frac{1}{4} = \frac{?}{12}$ by reasoning that since $4 \times 3 = 12$, 1 should be multiplied by 3, so $\frac{1}{4} = \frac{3}{12}$. Since the denominators will generally be 24 or less, if students know their multiplication facts well, this should be easy. This strategy cannot be used to solve a problem such as $\frac{6}{9} = \frac{?}{12}$ since students have only learned to multiply by a whole number. Students will only see how to solve this type of problem at this level in an optional Challenge problem in the workbook.

Simplifying Fractions

When we divide the numerator or denominator by the same number to get an equivalent fraction, we are "simplifying" the fraction. This can be done in steps.



The simplest form of a fraction is one where there is no whole number that both the numerator and denominator can be divided by (other than 1) in order to further simplify the fraction. The simplest form of $\frac{6}{18}$ is $\frac{1}{3}$.

In order to simplify a fraction and find its simplest form, students will have to determine a number that both the numerator and denominator can be divided by. At this level the numbers are less than 24, except for rare occasions in the workbook. If students cannot immediately see what number to divide by to get the simplest form, they can easily try dividing first by 2, then by 3, then by 4, etc. They should realize that the easiest way to simplify a fraction is in steps, in which case they will only have to recognize even numbers; that 3, 6, 9, 12, 18, 21 and 24 can be divided by 3; that 10 and 15 can be divided by 5; and that 7, 14, and 21 can be divided by 7. Students will formally learn about common factors and how to find the greatest common factor in Dimensions Math® 4A.

The easiest first step in simplifying a fraction is to recognize whether both the numerator and denominator are even and, if so, to divide the numerator and denominator by 2 as the first step, and for any subsequent steps until they are no longer both even. When they are not both even, they can check if both can be divided by 3 (the sum of the digits for both is a multiple of 3) or 5 (the ones digit is 0 or 5). After simplifying as much as possible this way, they can check whether both numbers can be divided by 7.

Students will learn to identify two fractions as equivalent fractions even when the numerator or denominator of one is not a simple multiple of the numerator or denominator of the other by finding the simplest form of both. For example, $\frac{6}{9}$ and $\frac{8}{12}$ are equivalent fractions; the simplest fraction for both is the same, $\frac{2}{3}$.

Comparing Fractions

In the previous chapter, students learned to compare fractions with the same denominator or the same numerator. In this chapter, students will use equivalent fractions to compare fractions that do not have the same numerator or denominator.

We can find equivalent fractions of one or both of the fractions being compared where the equivalent fractions have the same denominator or the same numerator. This may be challenging for some students because they need to recognize when one number is a multiple of the other, but at this level the numerators or denominators will generally be 16 or less.

For example, to compare $\frac{5}{8}$ and $\frac{3}{4}$, students need to recognize that 8 and 4 are "related" in that they can multiply 4 by 2 to get 8. They then find an equivalent fraction for $\frac{3}{4}$ with the same denominator as $\frac{5}{8}$. To compare $\frac{6}{7}$ and $\frac{3}{4}$, they need to recognize that 6 and 3 are "related" so they can find an equivalent fraction for $\frac{3}{4}$ with the same numerator as $\frac{6}{7}$.

(The guide will use the non-mathematical term "related" rather than the mathematical term "multiple" since students do not formally learn the term multiple until Dimensions Math® 4A. If your student has no trouble understanding what you mean if you say 8 is a multiple of 4, you can use that term instead, since its meaning is fairly obvious.)

When neither the numerators nor the denominators are related, students will systematically list fractions for each until they find ones with either the same numerator or the same denominator. If students do need to list equivalent fractions for both fractions they are comparing, they will only have to list at most five of each.

Students will also compare fractions by comparing them to 1 or to $\frac{1}{2}$.

These strategies will allow students to compare a set of fractions without having to first find common multiples, and without using some procedure without understanding it (such as "cross multiply"). They will formally learn to find common multiples in Dimensions Math® 4A, and the lowest common multiple of the denominator in Dimensions Math® 5A.

Adding and Subtracting Fractions

In Lessons 7 and 8, students will add and subtract fractions with the same denominator. The lessons may look like they will be long, but they should be easy; all students are doing are adding and subtracting numerators, and the sums and differences are all within 20.

Activities

- After Lesson 2
  Materials: Number cards 1–24
  Purpose: Create equivalent fractions.
  Procedure: Select a set of numbers that form equivalent fractions and have your student use all of them to make equivalent fractions. Use problems in the textbook or workbook for ideas of which numbers to use.
  Examples:

  4, 10, 8, 5 $\frac{8}{10} = \frac{4}{5}$

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

- After Lesson 3
  Materials: **Equivalent Fractions Puzzle** printout
  Purpose: Match equivalent fractions.
  Procedure: Have your student cut apart the triangles for the puzzle. They then match the sides with equivalent fractions. The puzzle will form a hexagon, as shown on the answer page.

- After Lesson 3
  Purpose: Create fractions in simplest form.
  Procedure: Write 5 or so numbers between 1 and 12 and have your student use them to make as many fractions (less than 1) in simplest form they can. (This can be done as a game. See the example under Games.)

Games

- After Lesson 3
  Materials: Number cards 1–12, as many sets as players (or playing cards with Kings removed; Jack is 11 and Queen is 12)
  Purpose: Create fractions in simplest form.
  Goal: Get the most points.
  Procedure: Shuffle the cards and turn them face down in the middle. Each player draws 6 cards and uses the numbers to write as many fractions less than 1 in simplest form as possible. For example, a player draws the cards 3, 4, 5, 8, 9, and 12. They can write the fractions $\frac{3}{4}$, $\frac{3}{5}$, $\frac{3}{8}$, $\frac{4}{5}$, $\frac{5}{8}$, $\frac{5}{9}$, $\frac{5}{12}$, and $\frac{8}{9}$. Players get as many points as fractions they formed for that round. Game can continue as many rounds as agreed upon in advance and players can keep a running total. The player with the most points at the end wins.
  Variation: Students draw fewer than six cards.
  Variation: Use number cards 1–24.

Lesson 2 Finding Equivalent Fractions (pp. 58–60)

Think (p. 58)

Instead of going directly to the textbook, you can give your student the **Lesson 10-2** printout. Ask them to shade the same half of each bar for the set of bars on the left, and the same third of each bar for the set of bars on the right. Ask them to write the fraction shaded next to each bar. Discuss any observations they make of both the bars and the written fractions. Try to get them to relate their observations for the bars to the numbers in the written fractions. For example, if they observe that half of the total number of parts are shaded, they could also observe that the denominator is always twice the numerator.

Learn (pp. 58–59)

This gives some observations that could be made. The primary observations are the last two, made by Emma and Alex. Students should conclude that if the numerator and denominator are multiplied by the same number, the resulting fraction is equivalent to the original fraction.

Do (p. 60)

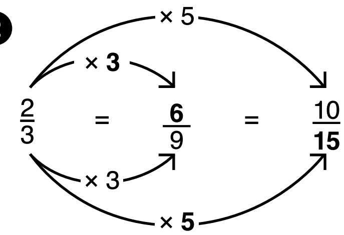
❷ This problem helps prepare students for the next problem. To solve $\frac{2}{3} = \frac{?}{9}$, they need to identify what number 3 must be multiplied by to get 9, and then multiply 2 by the same number to find the unknown numerator.

Answers

Answers can vary, Examples:
$\frac{1}{2} = \frac{5}{10}$, $\frac{1}{3} = \frac{5}{15}$

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

❷



❸ (a) $\frac{\mathbf{3}}{12}$ (b) $\frac{\mathbf{6}}{15}$ (c) $\frac{\mathbf{6}}{14}$

(d) $\frac{6}{\mathbf{18}}$ (e) $\frac{3}{\mathbf{24}}$ (f) $\frac{4}{\mathbf{8}}$

❹ Answers can vary. Examples:

(a) $\frac{3}{15}$, $\frac{4}{20}$, $\frac{5}{25}$

(b) $\frac{4}{14}$, $\frac{6}{21}$, $\frac{8}{28}$, $\frac{10}{35}$

❸ Students will need to determine what number the denominator was multiplied by for (a)–(c) and what number the numerator was multiplied by for (d)–(f).

❹ Answers can vary since students have not yet learned to systematically list equivalent fractions by first multiplying the numerator and denominator by 2, then 3, then 4, and so on, and are not required to. So $\frac{100}{500}$ is a valid equivalent fraction for $\frac{1}{5}$, for example.

Lesson 3 Simplifying Fractions (pp. 61–64)

Think (p. 61)

Before looking at the textbook, give your student a copy of the **Lesson 10-3** printout and ask them to color the first 8 parts of the top bar and write the fraction that is shaded. Then have them find bars that show equivalent fractions of this fraction, color those bars the same way, and write the equivalent fractions. They can cut out the strips in order to align them with each other. Discuss any observations they make, asking them how they can “go” from the fraction with the greater denominator to an equivalent fraction with a lesser denominator.

Learn (pp. 61–62)

On page 61, for the orange bars, your student should observe that every 2 units in the twelfths bar becomes 1 unit in the sixths bar, and then every 2 units of the sixths bar becomes 1 unit of the thirds bar. So both the number of shaded parts and the total number of parts are divided by 2 and then by 2 again to get the equivalent fractions. For the green bars, every 4 units in the twelfths bar becomes 1 unit in the thirds bar, so both the numerator and denominator are divided by 4.

Ask your student if the units for the last bar showing thirds could be combined so that there are equal units for shaded and unshaded parts. They cannot. Tell them that $\frac{2}{3}$ is the “simplest” fraction of the three factions here ($\frac{8}{12}$, $\frac{4}{6}$, and $\frac{2}{3}$). It has the fewest possible equal parts, and is the easiest to imagine, or picture, in our minds.

Answers

$\frac{\mathbf{4}}{6}$

$\frac{\mathbf{2}}{3}$

$\frac{2}{\mathbf{3}}$

$\frac{2}{3}$

1 (a) $\frac{9}{12} = \frac{6}{\mathbf{8}} = \frac{\mathbf{3}}{4}$

(b) $\frac{3}{4}$

2 $\frac{8}{16}$ in = $\frac{4}{\mathbf{8}}$ in = $\frac{2}{\mathbf{4}}$ in = $\frac{1}{\mathbf{2}}$ in

3 (a) $\frac{\mathbf{4}}{5}$ (b) $\frac{\mathbf{1}}{3}$

(c) $\frac{\mathbf{5}}{6}$ (d) $\frac{3}{\mathbf{6}}$

(e) $\frac{3}{\mathbf{4}}$ (f) $\frac{1}{\mathbf{2}}$

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

5 (a) $\frac{2}{3}$ (b) $\frac{1}{2}$

(c) $\frac{3}{4}$ (d) $\frac{1}{2}$

(e) $\frac{1}{5}$ (f) $\frac{5}{6}$

6 $\frac{5}{10}$ $\frac{4}{8}$ $\frac{7}{14}$ $\frac{3}{6}$

A fraction is equal to $\frac{1}{2}$ if the denominator is twice the numerator.

Discuss page 62. Point out that we can simplify a fraction to its simplest form in either one step or more than one step. Discuss Alex’s question at the bottom of the page. A fraction is in its simplest form if there is no number greater than 1 that both the numerator and denominator can be divided by so that there is no remainder.

Do (pp. 63–64)

❶ Your student may notice that this problem is the "reverse" of ❶ in the previous lesson.

❹ This problem points out that two fractions may be equivalent even if we cannot think of a number to multiply or divide both the numerator and denominator of one fraction by to get the other fraction. The way to see if they are equivalent is to put both of them in simplest form. If the simplest forms of both fractions are the same, the fractions are equivalent.

❻ Students will be comparing fractions to $\frac{1}{2}$ by comparing the numerator to the denominator in Lesson 5. Your student could answer that the numerator is half of the denominator. Students have not yet formally learned the connection between division and fractions (e.g. $\frac{1}{2}$ of $12 = \frac{12}{2} = 12 \div 2 = 6$) but can certainly intuit it by now.

Reinforcement

Equivalent fractions are important in computations with fractions, so it is worth spending time making sure your student can recognize them. One way to further investigate equivalent fractions with even greater denominators than they will encounter in the textbook or workbook is with a multiplication chart.

You can use the **Multiplication Chart** printout. Point out two rows, such as 3 and 4 or 3 and 8. Ask your student to think of the top number as the numerator and the bottom number as the denominator of a fraction for the numbers in the same column. List them. For example:

×	1	2	3	4	5	6	7	8	9	10
1	1	2	3	4	5	6	7	8	9	10
2	2	4	6	8	10	12	14	16	18	20
3	3	6	9	12	15	18	21	24	27	30
4	4	8	12	16	20	24	28	32	36	40
5	5	10	15	20	25	30	35	40	45	50
6	6	12	18	24	30	36	42	48	54	60
7	7	14	21	28	35	42	49	56	63	70
8	8	16	24	32	40	48	56	64	72	80
9	9	18	27	36	45	54	63	72	81	90
10	10	20	30	40	50	60	70	80	90	100

$\frac{3}{4}, \frac{6}{8}, \frac{9}{12}, \frac{12}{16}, \frac{15}{20}, \frac{18}{24}, \frac{21}{28}, \frac{24}{32}, \frac{27}{36}, \frac{30}{40}$

$\frac{3}{8}, \frac{6}{16}, \frac{9}{24}, \frac{12}{32}, \frac{15}{40}, \frac{18}{48}, \frac{21}{56}, \frac{24}{64}, \frac{27}{72}, \frac{30}{80}$

Your student should notice the fractions in each list are equivalent to the first fraction in. Both the numerator and denominator of the first fraction is multiplied by the same number to get each subsequent fraction.

Point out that we cannot always simply multiply or divide directly to show that two fractions are equal. For example, $\frac{15}{20} = \frac{21}{28}$; both of them are equal to $\frac{3}{4}$, and so are equal to each other.

Chapter 11 Workbook Answers

(c) **3 km 40 m**

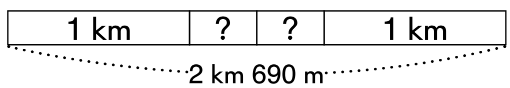
4 × 760 m = 3,040 m

(d) **590 m farther**

1,260 m + 430 m + 760 m = 2,450 m

3,040 m − 2,450 m = 590 m

(e) **345 m**



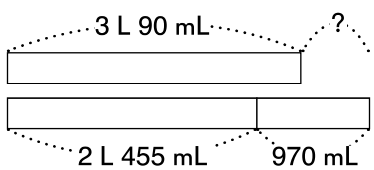
2 km 690 m − 2 km = 690 m

690 m ÷ 2 = 345 m

6 **25 cm**

200 cm ÷ 8 = 25 cm

7 **335 mL**



2,455 mL + 970 mL = 3,425 mL

3,425 mL − 3,090 mL = 335 mL

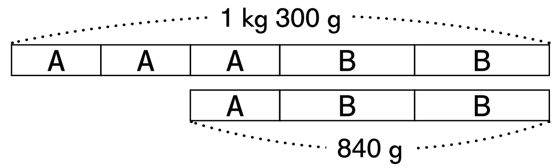
Or:

3,090 mL − 2,455 mL = 635 mL

970 mL − 635 mL = 335 mL

Students are unlikely to use the second method, but if they draw a bar model they might. It is provided here to illustrate that using bar models can lead to creative solutions.

8 **535 g**



If students draw a bar model, they may simply draw one in the order the information is given, align them at the left, and then be unable to determine a method of solution. Suggest they slide one bar to the right so that the Bs align, or flip their model so the Bs are first. Redrawing models is a good problem solving strategy. This problem is similar to the balance ones on page 100, but more abstract since there is no image. You can suggest they draw a picture of a balance and see if they can solve the problem from that.

1,300 g − 840 g = 460 g (two As)

460 g ÷ 2 = 230 g (one A)

840 g − 230 g = 610 g (two Bs)

610 g ÷ 2 = 305 g (one B)

305 g + 230 g = 535 g

Or:

Two As and two Bs:

840 g + 230 g = 1,070 g

One A and one B:

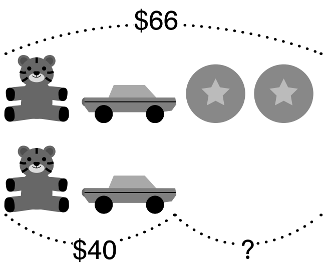
1,070 g ÷ 2 = 535 g

Some students may think of the second method since the problem asks for the weight of A and B together. They might have no difficulty dividing 1,070 by 2 and may divide mentally; if they can't, they may have to resort to the first method.

Chapter 15 Workbook Answers

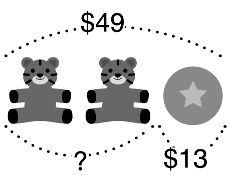
7 **ball: \$13, tiger: \$18, car: \$22**

Students could draw bar models, aligning like ones, even if they do not know the relative lengths of the bars to show each total. They could also think of the toys aligned similar to bar models, or draw them that way. If necessary, suggest they start by comparing sets where the difference is only one type of object.



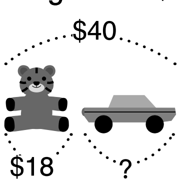
2 balls ⟶ \$66 – \$40 = \$26

1 ball ⟶ \$26 ÷ 2 = \$13



2 tigers ⟶ \$49 – \$13 = \$36

1 tiger ⟶ \$36 ÷ 2 = \$18



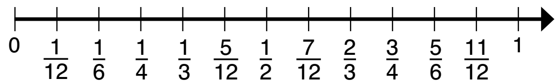
1 car ⟶ \$40 – \$18 = \$22

Exercise 7 pp. 217–221

1 \$4,209

2 Quotient: 85
Remainder: 7

3

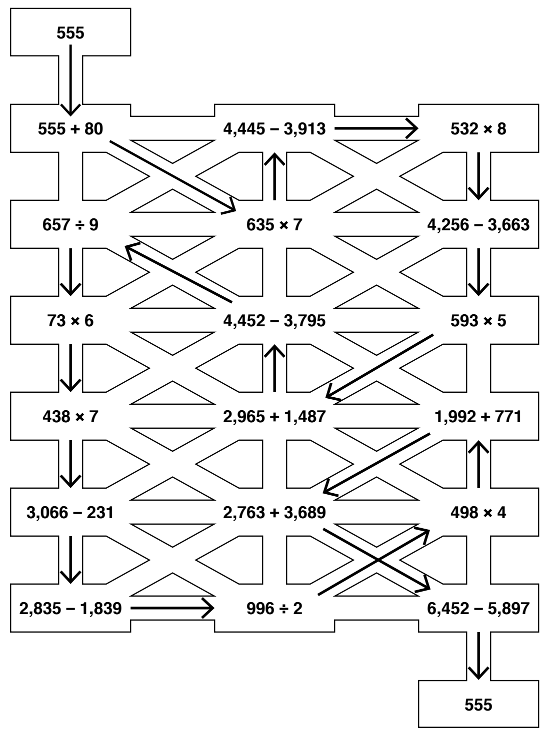


4 **3 L 160 mL**

bottle: 2,250 mL – 1,340 mL = 910 mL

both: 910 mL + 2,250 mL = 3,160 mL

5



6 (a) $\frac{1}{2}$

(b) 32 square units

7 16

8 (a) **about 13 miles**

66 ÷ 5 is 13 R 1

(b) **about 3 km 60 m**

9 × 340 m = 3,060 m

Chapter 15 Workbook Answers

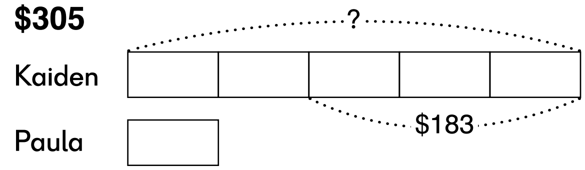
9 (a) **26 cm**
7 cm + 7 cm + 12 cm = 26 cm
(b) 2
(c) 2
(d) **rhombus, 28 cm**
4 × 7 cm = 28 cm

10 (a) **2 min 8 s longer**
10 min 11 s – 8 min 3 s = 2 min 8 s
(b) **12 h 22 min 59 s**
April 8 is 6 days after April 2
There will be a gain of 6 times as many minutes and seconds.
6 × 2 min = 12 min
6 × 8 s = 48 s
12 h 10 min 11 s + 12 min 48 s
= 12 h 22 min 59 s

11 **At least 3 times**
120 m + 60 m = 180 m
2 × 180 m = 360 m
Perimeter: 360 m
2 × 360 m = 720 m, less than 1 km
3 × 360 m = 1,080 m, more than 1 km

12 **148 cm**
The perimeter is 24 sides.
6 sides = 37 cm
24 ÷ 6 = 4
There are 4 groups of 6 sides.
4 × 37 cm = 148 cm
If your student first tries to find the length of a side and divide 37 by 6, and then does not know how to proceed since there is a remainder, suggest they think about "flattening" out a hexagon and laying its perimeter along the perimeter of the whole figure.

13 **$305**



1 unit ⟶ $183 ÷ 3 = $61
5 units ⟶ 5 × $61 = $305
Drawing a bar model makes this problem relatively easy.

Exercise 8 pp. 222–226

1 (a) 280
(b) 36
(c) 5
(d) 9

2 **19 lollipops**
$4 = 16 quarters
80¢ = 3 quarters and 1 nickel
Total quarters = 19

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

4 (a) A 152 cm
B 3 m 48 cm
C 370 cm
D 1 m 58 cm
(b) C

5 **A, $\frac{1}{3}$ m**
Pole A: $1 - \frac{4}{9} = \frac{5}{9}$
Pole B: $1 - \frac{7}{9} = \frac{2}{9}$
$\frac{5}{9} - \frac{2}{9} = \frac{3}{9} = \frac{1}{3}$
Students may simply draw a picture or even a number line.