Scheme of Work

Week		TB	WB	Guide
1	**Chapter 10 Measurement**			1–6
	Chapter Opener	1		7–8
	1 Metric Units of Measurement	2–6	1–3	9–10
	2 Customary Units of Length	7–11	4–7	11–12
	3 Customary Units of Weight	12–15	8–10	13
2	4 Customary Units of Capacity	16–19	11–13	14–15
	5 Units of Time	20–22	14–16	16–19
	6 Practice A	23–24	17–19	20
	7 Fractions and Measurement — Part 1	25–27	20–22	21
3	8 Fractions and Measurement — Part 2	28–30	23–25	22
	9 Practice B	31–32	26–28	23
	Workbook Chapter 1 Answers			24–30
	Dimensions Math® Tests 4B, Chapter 10, pp. 1–12			
	Chapter 11 Area and Perimeter			31–35
	Chapter Opener	33		36
	1 Area of Rectangles — Part 1	34–37	29–31	37
4	2 Area of Rectangles — Part 2	38–40	32–34	38
	3 Area of Composite Figures	41–45	35–38	39–40
	4 Perimeter — Part 1	46–50	39–41	41
	5 Perimeter — Part 2	51–55	42–44	42–43
5	6 Practice	56–58	45–48	44–45
	Workbook Chapter 11 Answers			46–50
	Dimensions Math® Tests 4B, Chapter 11, pp. 13–24			

Materials

Materials

- 1-cup measuring cup
- 1-quart measuring cup
- Compass
- Cube
- Cuboid (rectangular prism)
- Cup, pint, quart, half-gallon, and gallon containers
- Measuring tape
- Meter/yard stick
- Place-value discs for hundreds, tens, ones, tenths, and hundredths
- Platform scale showing pounds
- Protractor
- Ruler
- Set Squares

Optional

- 1-liter beaker
- Balance
- Compass (directional)
- Customary weight set
- Counters
- Demonstration analog clock
- Geoboard
- Laminated hundred board
- Metric weight set
- Pattern blocks
- Small rectangular mirror
- Tangrams
- Ten-sided die

Mental Math Sheets

Available for free download at singaporemath.com/higprintouts. Also available for purchase in ready-to-use packs at singaporemath.com.

Printouts

Available for free download at singaporemath.com/higprintouts. Also available for purchase in ready-to-use packs at singaporemath.com.

- Area and Perimeter Review
- Centimeter Graph Paper
- Conversion Tables
- Elapsed Time
- Fraction Bars to Twelfths
- Hundred Chart
- Hundredth Chart
- Inch Graph Paper
- Lesson 10-4
- Lesson 12-8
- Lesson 12-9
- Lesson 15-1
- Lesson 15-2
- Lesson 15-5
- Lesson 16-2
- Lesson 16-3
- Lesson 16-5
- Lesson 16-6
- Lesson 16-7
- Lesson 17-1
- Lesson 17-2
- Lesson 17-4
- Metric System Prefixes
- Number Cards 0–10
- Number Cards 11–24
- Pentominoes
- Place-value Cards Hundreds to Hundredths
- Set Squares

Chapter 10 Measurement

Materials

Materials

- 1-cup measuring cup
- 1-quart measuring cup
- Cup, pint, quart, half-gallon, and gallon containers
- Measuring tape showing centimeters and inches
- Meter stick
- Platform scale showing pounds

Optional

- 1-liter beaker
- Balance
- Customary weight set
- Demonstration analog clock with geared hands
- Metric weight set

Printouts

(singaporemath.com/higprintouts)

- Conversion Tables
- Elapsed Time
- Fraction Bars to Twelfths
- Lesson 10-4
- Metric System Prefixes

Mental Math

(singaporemath.com/higprintouts)

Mental Math		After Lesson
1	Subtract from 1 unit for metric measures	1
2	Add or multiply metric measures	1
3	Subtract or divide metric measures	1
4	Subtract from 1 unit for customary measures	4
5	Add and subtract customary measures	4
6	Add and subtract time units	4
7	Elapsed time and time intervals	4

Notes

Measurement Systems

In the Dimensions Math® curriculum, students learn to measure and perform calculations in two distinct measurement systems: the metric system and what this guide will call the "U.S. customary system" (sometimes called the "imperial system"). All countries have either fully adopted or legally sanctioned the International System of Units, or SI, the modern form of the metric system. Currently, only the United States of America, Liberia, and Myanmar still commonly use the "imperial system" of measurement. Students in the U.S. do need to learn the outdated and cumbersome customary system. However, the metric system is given a predominant place in this curriculum. In the U.S., the metric system is designated as the preferred system of weights and measures for U.S. trade and commerce. The metric system is used predominantly in science even in the U.S.

In Dimensions Math® 2, students learned to estimate, measure, and compare lengths, weights or masses, and capacities in both systems of measurement. They learned to measure in centimeters, meters, kilograms, grams, and liters, which are part of the metric system. They also learned to measure in inches, feet, and pounds, and were briefly introduced to gallons, quarts, and cups. In Dimensions Math® 3B, students learned about kilometers and milliliters as units of mass and capacity, respectively. They learned to work with compound units and to add and subtract measurements given in compound units in the metric system only. In this chapter, students will learn about the millimeter and ounce as units of length and weight, respectively. They will review conversions and calculations within the metric system, and will learn to work with compound units and calculate within the U.S. customary system.

There is no standard abbreviation for liters or milliliters since they are not part of the International System of Units (which instead has units for volume, such as cm^3). This curriculum uses L for liters and mL for milliliters.

Mass and weight are different attributes of an object. Mass is a measure of an object's resistance to acceleration when a net force is applied and is dependent on the amount of matter in the object. The kilogram and gram are units of mass. Weight is a measure of the gravitational pull between two objects and is generally measured using a scale where the gravitational pull is calibrated. The pound and the ounce are units of weight. In this curriculum, a formal distinction will not be made between mass and weight. This can be done in science lessons. The verb "weigh" will be used even when finding the mass of an object. Even in countries where only the metric system is used, daily speech includes "weighing" an object to find its mass.

Compound Units

In Dimensions Math® 2, students only measured in a single unit. For example, they measured the length of an object to the nearest centimeter or to the nearest inch. In Dimensions Math® 3B, students learned to express measurements in compound units, such as 4 m 20 cm or 6 L 200 mL. They learned to convert between a smaller unit of measurement and a compound unit or larger unit of measurement, such as expressing 4,020 g as 4 kg 20 g. This was possible because the metric system is based on the base-ten system of numeration and so the only units of conversion were 100 and 1,000. Students could convert using place-value concepts, rather than specifically thinking in terms of multiplying or dividing by 100 or 1,000.

In this chapter, students will review conversion factors for U.S. customary units that they have already learned, such as the fact that there are 12 inches in a foot. They will learn that an ounce is a smaller unit of weight and that there are 16 ounces in a pound. They will express measurements in compound units and convert from a larger to a smaller unit and, in some cases, a smaller to a larger unit. Converting from a larger to a smaller unit involves multiplication (for example, 4 ft = 4 × 12 in = 48 in). Students have already done similar calculations, such as finding the number of days in a given number of weeks or minutes in a given number of hours. Converting from a smaller to a larger unit involves division (for example, 48 in = 48 in ÷ 12 = 4 ft). Since students have not yet learned to divide by a two-digit number, they will generally have to rely on a conversion table which they will generate using multiplication, and the values will generally be within 5 times the conversion factor.

Calculations with Compound Units

With the metric system, students can easily convert compound units to the smaller unit and then use the algorithms to add or subtract. They have learned mental math strategies for subtracting from 100 and from 1,000, and can apply these strategies to mentally add or subtract in compound units in the metric system by making the next 100 or 1,000, or subtracting from 100 or 1,000. This is similar to what they have learned to do when adding or subtracting money amounts. For example, to find 8 m 5 cm – 3 m 85 cm, subtract the meters first: 8 m – 3 m = 5 m. Since 85 cm is greater than 5 cm, there will be 1 less meter, so write down 4 m. Then subtract 85 from 100 and add 5 to get 20 for the centimeters: 4 m 20 cm.

In the U.S. customary system, measurements are often given in compound units. Since this system is not based on a base-ten system, it is easier to add or subtract compound units by converting just one of the larger units to a smaller unit as needed, rather than all of them. Students can apply mental math strategies. If your student has done previous levels of the Dimensions Math® curriculum, they have already done this for calculations with time and money.

For example, to add 3 lb 9 oz and 4 lb 9 oz, first add the pounds. To add the ounces, either add them and then convert, or split one addend to make 16 with the other, which involves mentally subtracting 9 from 16 and then 7 from 9:

```
3 lb 9 oz + 4 lb 9 oz = 7 lb 9 oz + 9 oz

  7 lb 9 oz + 9 oz = 7 lb 18 oz
                   = 8 lb 2 oz
Or:
  7 lb 9 oz + 9 oz = 8 lb 2 oz
              / \
             7   2
```

To subtract 9 ft 8 in from 13 ft 3 in, first subtract the feet. Then either convert 1 ft to inches and subtract, or subtract from 12 in.

```
13 ft 3 in – 9 ft 8 in = 4 ft 3 in – 8 in

  4 ft 3 in – 8 in = 3 ft 15 in – 8 in
                   = 3 ft 7 in
Or:
   4 ft 3 in – 8 in = 3 ft 3 in + 4 in
   /  \
3 ft  12 ft          = 3 ft 7 in

Or:
  4 ft 3 in – 8 in = 4 ft – 5 in
            /  \   = 3 ft 7 in
         3 in  5 in
```

Students should be flexible in their thinking and use different strategies for different problems, depending on the numbers and what mental calculation they find easier. For example, for 3 lb 1 oz – 8 oz, it might be easier to subtract 8 oz from one of the pounds and add back in 1 oz, but for 3 lb 8 oz – 11 oz, it might be easier to subtract 8 oz first, and then subtract the remaining 3 oz from 3 lb.

In Dimensions Math® 3B, students learned to convert between minutes and hours (as well as seconds and minutes) and to add and subtract time in compound units. They learned to apply the same mental math strategies of making the next unit or subtracting from a unit, particularly when the minutes were multiples of 5, first with the aid of a clock face and then without. In this chapter, they will be doing this after they look at other customary units, and so should not have much difficulty, even though the conversion unit is greater (60). If they did not do Dimensions Math® 3B, though, you may want to spend a little extra time on this. For example, for addition:

```
3 h 35 min + 4 h 35 min = 7 h 35 min + 35 min

  7 h 35 min + 35 min = 7 h 70 min
                      = 8 h 10 min
Or:
  7 h 35 min + 35 min = 8 h 10 min
               /  \
             25    10
```

For subtraction:

13 h 5 min – 9 h 45 min = 4 h 5 min – 45 min

4 h 5 min – 45 min = 3 h 65 min – 45 min
= 3 h 20 min

Or:

4 h 5 min – 45 min = 3 h 5 min + 15 min
/ \
3 h 60 min
= 3 h 20 min

Or:

4 h 5 min – 45 min = 4 h – 40 min
/ \
5 40
= 3 h 20 min

Fractions and Measurement

Students learned to find the fraction of a set in Dimensions Math® 4A, including instances that involved measurement units. For example, they learned how to find $\frac{3}{4}$ of 6 ft using multiplication: $\frac{3}{4} \times 6$ ft = $\frac{18}{4}$ ft = $4\frac{1}{2}$ ft. (Finding a fraction of 6 ft is not the same conceptually as finding 6 groups of $\frac{3}{4}$ ft, but the calculations are the same.) They expressed the answer as a whole number, fraction, or mixed number in the same measurement unit.

In this chapter, students will learn to convert a measurement given as a fraction or a mixed number to a smaller unit or compound units. For example, $\frac{2}{3}$ ft = $\frac{2}{3} \times 12$ in = 8 in. Therefore, $5\frac{2}{3}$ ft = 5 ft 8 in.

Students will also learn to express a quantity given in the smaller unit as a fraction of a quantity in a greater unit. For example, to express 20 minutes as a fraction of 2 hours, both measurements need to be the same unit. 20 minutes out of 2 hours is $\frac{20}{120} = \frac{1}{6}$ of 2 hours.

Both of these concepts require a mastery of the material in Dimensions Math® 4A.

Chapter Opener (p. 1)

In reviewing the units of measure in this Chapter Opener, use whatever measurement tools you have available, such as a meter or yard sticks, measuring tapes, a scale, a balance and weights, beakers, or measuring cups.

If you live in the U.S., you may want to first discuss the units that Sofia is indicating. Students should be familiar with inches, feet, yards, and miles (units of length), ounces and pounds (units of weight), and cups, quarts, and gallons (units of capacity). You can have them estimate using some of these units. For example, ask them questions such as:

- About how long is this room in feet?
- About how wide is this table in inches?
- How many ounces do you think this apple weighs?
- How many pounds do you think you weigh?
- About how many gallons of water does it takes to fill a bathtub halfway? (about 20 gallons)

You can have them check their estimations where feasible, making sure they can use the measurement tools appropriately.

Discuss the units Dion is indicating. Your student should know that there are two separate "systems" of measurement, one used in most of the world and in science (the metric system), and one with units that are customary based on historical use. The measurement tools Dion is indicating are for the metric system. Your student should be familiar with centimeters, meters, and kilometers (units of length), milligrams and grams (units of mass), and milliliters and liters (units of capacity). You can have them estimate using these units, preferably the same items they used for estimations in the U.S. customary system, and check their estimates where feasible.

If your student did not use Dimensions Math® 3B, they may not be familiar with the idea of expressing measurements in compound units, in which case you might want to do the following activity (or something similar). Alternately, you can just explain compound units as your student encounters them in the lessons.

Have your student measure their height using a meter stick. You can mark their height on a wall with masking tape or pencil, or have them lie on the floor and mark their heel and the top of their head. They will find that their height is more than 1 meter. Help them with repositioning the meter stick to determine their height past 1 meter. Tell them they can write the measurement as 1 meter and then some centimeters (for example, 1 m 45 cm). Remind them that 1 meter is the same as 100 centimeters.

Then, have your student measure their height with a tape measure that is marked in centimeters. Sewing tape measures often do not indicate the meters, just the total centimeters. Cased tape measures (in the

U.S.) will generally give the measurement in total number of centimeters, but may only include the tens every ten centimeters. Have your student write how many centimeters their height is (for example, 145 cm). Compare the two recorded measurements. Remind them that since 100 cm is equal to 1 m, we know that 145 cm is the same as 1 m and 45 cm, which we can write as 1 m 45 cm. Point out that expressing longer lengths this way, rather than just using the smaller unit of measurement, gives a better feel for how long the length or distance is.

Then, have your student measure their height in inches using a measuring tape, record that, and then use a ruler or the feet markings on a tape measure to write their height in feet and inches. Make sure they can read the measuring tools correctly. (Similar to not indicating meters, sewing tapes do not indicate feet, but cased tapes usually do, so they could determine the feet and inches using those markings.)

If your student does not have a feel for units of mass, and you have a balance and a metric weight set, you might want to spend some time letting them weigh objects. They should know that there are 1,000 milligrams in a kilogram, about what a kilogram feels like, and that a milligram is very light (a paper clip weighs about 1 milligram). You can also let them determine what a pound feels like, using something like a pound bag of beans. They can estimate some weights and then check them with a balance. For example, 3 to 4 apples weigh about a pound, or about half of a kilogram.

Lesson 8 Fractions and Measurement — Part 2 (pp. 28–30)

Think (p. 28)

Have your student read the problem and find the answers. They should not have much difficulty if they mastered previous concepts. If they struggle, draw four fraction bars for twelfths, or let them use four rulers to visualize the problem. (Crotalus is the genus name for rattlesnakes.)

Learn (p. 28)

To convert a measurement given as a mixed number into compound units, we just need to convert the fraction part.

To give the measurement in the smaller unit only, we need to also convert the whole number part and add.

Do (pp. 29–30)

2 To express 4 inches as a fraction of $3\frac{2}{3}$ ft, both measurements have to be in the same unit. (In the given solution, they are both expressed in inches. The answer could also be obtained if both measurements are in feet, but students do not yet know how to divide fractions. An alternate solution is to reason that 4 inches is 1 third of a foot, $3\frac{2}{3}$ is 9 thirds + 2 thirds, or 11 thirds of a foot. So 4 inches out of $3\frac{2}{3}$ ft is 1 third out of 11 thirds of a foot, or $\frac{1}{11}$. You can discuss this alternate solution if you want.)

7 8 For both of these, students could instead first convert the mixed numbers to the smaller measurement unit and then add or subtract the kilometers or fluid ounces.

Answers

(a) 3 ft 8 in
(b) 44 in

1 (a) 2 lb 8 oz
(b) 40 oz

2 $\frac{1}{11}$

3 = 3 × **1,000** mL = **3,000** mL
= $\frac{2}{5}$ × **1,000** mL = **400** mL
= **3,400** mL

4 (a) 3 km 250 m
(b) 3 qt 3 c

5 (a) 260 cm (b) 42 h
(c) 20 fl oz (d) 22 oz
(e) 4,700 mL (f) 145 min
(g) 216 s (h) 5 pt

6 **5 m 60 cm**
$\frac{3}{5}$ m = $\frac{3}{5}$ × 100 m = 60 cm

7 **6,250 m**
$2\frac{1}{2}$ km + $3\frac{3}{4}$ km = $6\frac{1}{4}$ km = 6,250 m

8 **14 fl oz**
$3\frac{1}{4}$ c − $1\frac{1}{2}$ c = $1\frac{3}{4}$ c = 14 fl oz

9 **$\frac{1}{7}$ of her time**
15 min is 1 fourth of an hour.
$1\frac{3}{4}$ h is 7 fourths of an hour.
1 out of 7 fourths is $\frac{1}{7}$.
Or:
$1\frac{3}{4}$ h = 60 min + 45 min = 105 min
$\frac{15}{105} = \frac{1}{7}$

Lesson 5 Perimeter — Part 2 (pp. 51–55)

Think (p. 51)

Have your student read the problem and attempt to find the answer, without seeing Learn.

Learn (pp. 51–52)

Method 1 is the most likely method students will use if they were able to solve the problem (unless they did some of the Challenges in Dimensions Math® 3B for this topic). They will need to find two lengths that are not given.

Method 2 is new, and using this method facilitates calculations. (This method works because this is a rectilinear figure so the sides are perpendicular or parallel to each other.)

Do (pp. 53–55)

1. The provided solution uses Method 2. Students could use a different method to find the perimeter of the rectangle, or may use Method 1. They do not have to use both methods for one problem.

2. Students can use either method, but Method 2 makes the calculations easier, since the mixed number side lengths are not involved.

3. Students should realize there is not enough information to use Method 1; they need to use the method Sofia is thinking of.

Answers

20 m

1. **1 m 6 cm**
   28 cm + 25 cm = 53 cm
   2 × 53 cm = 106 cm = 1 m 6 cm

2. **28 ft**
   9 ft + 5 ft = 14 ft
   2 × 14 ft = 28 ft

3. **4 m 60 cm**
   25 cm + 30 cm + 65 cm = 120 cm
   1 m 10 cm = 110 cm
   120 cm + 110 cm = 230 cm
   2 × 230 cm = 460 cm = 4 m 60 cm

4. **136 ft**
   Dion's method:
   Missing length:
   36 ft – 12 ft – 12 ft = 12 ft
   5 sides are 12 ft: 5 × 12 ft = 60 ft
   60 ft + 20 ft + 36 ft + 20 ft = 136 ft
   Emma's method:
   36 ft + 20 ft = 56 ft
   2 × 56 ft = 112 ft
   2 × 12 ft = 24 ft
   112 ft + 24 ft = 136 ft

(Continued next page.)

4. Discuss both methods. For Dion's method, the first step is to find the unknown side. The next step given is to multiply 5 by 12, since there are 5 sides that measure 12 ft.

Students could also multiply 20 by 2 before adding. For Emma' method, make sure your student understands why the two 12-ft sides need to be added to the perimeter of the enclosing rectangle.

5. Students will have to use Method 2, as Mei is indicating, since there is not enough information to find all the side lengths.

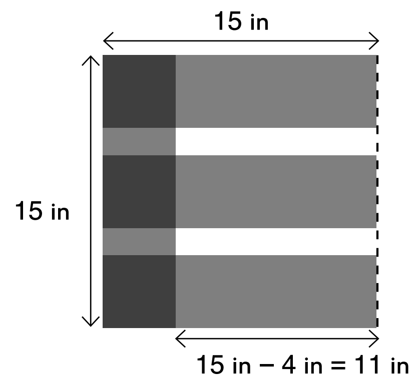
6. Students will again have to use Method 2. Make sure your student understands that the perimeter will be the same even if the three horizontal strips are not evenly spaced.

7. Students cannot use Method 2 exclusively for the entire figure since they will not be able to find the length of an enclosing rectangle. However, they should realize that they can use the given width, $2\frac{3}{4}$ ft, and not need to worry about the widths of the individual horizontal sides. The following figures all have the same perimeter:

Answers (continued)

5. **94 cm**
   15 cm + 19 cm = 34 cm
   2 × 34 cm = 68 cm
   2 × 13 cm = 26 cm
   68 cm + 26 cm = 94 cm

6. **104 in**



   4 × 15 in = 60 in
   4 × 11 in = 44 in
   60 in + 44 in = 104 in

7. (a) **16 ft**
   $\frac{7}{8} + 1\frac{1}{2} + \frac{7}{8} + 2\frac{3}{4} + 3 + 3 + 2 + 2$
   $= 13 + \frac{7}{8} + \frac{4}{8} + \frac{7}{8} + \frac{6}{8}$
   $= 13 + 3$
   $= 16$
   (b) **192 in**
   16 ft = 16 × 12 in = 192 in

Lesson 4 Hundredths — Part 2 (pp. 77–82)

Think (p. 77)

Have students read the problem and attempt to find the answer. They should not have much difficulty. Mei does show one way of thinking about the problem, which relates to the previous lesson.

Learn (pp. 77–78)

Method 1 focuses on thinking of the decimals as fractions. Method 2 focuses on thinking in terms of place value. The focus in this lesson is not on adding or subtracting decimals. Students should understand what the value of each digit is, which is determined by its position or place relative to the decimal point.

Do (pp. 79–82)

1. Decimal numbers are represented here in a variety of ways, with the emphasis on expressing specific fractions as decimals. The fraction squares are a more pictorial representation than place-value discs and are color-coded to match the place-value discs.

3. As with whole numbers, when there is a 0 in a place, it is not included in the expanded form as a separate value.

7. If your student is struggling, let them use place-value discs and a place-value chart.

8. We need to take away all the tenths in 2.75, leaving a number with 0 in the tenths place.

Answers

1.35 L
tenths
hundredths 5

1 (a) $= 1 + \frac{\mathbf{2}}{10} + \frac{\mathbf{4}}{100}$
1.2 4

(b) 2.0 6

2 4.8 2
ones
tenths **8** tenths
hundredths **2** hundredths or 0.**02**
= 4 + **0.8** + **0.02**

3 (a) 3.2 4 — 3.24
(b) 3 4.5 2 — 34.52
(c) 9 6.0 7 — 96.07

4

(a)	9.17	9 + 0.01 + 0.07
(b)	30.48	30 + 0.4 + 0.08
(c)	6.05	6 + 0.05
(d)	102.12	100 + 2 + 0.1 + 0.02

5 A: $2\frac{2}{100}$, 2.02 B: $2\frac{5}{100}$, 2.05
C: $2\frac{14}{100}$, 2.14 D: $2\frac{18}{100}$, 2.18

6 (a) 2.09 (b) 4.25 (c) 30.04

7 (a) 50.07
(b) 4 + **0.6** + **0.08**
(c) 20 + 9 + **0.08**
(d) 4.03
(e) 39
(f) 802.05

8 2.05 m
2.75 – 0.7 = 2.05

Chapter Opener (p. 105)

This Chapter Opener serves to give students an idea of what they will be learning in this chapter. You do not need to spend time on it, other than asking them how they would find the answer (add the amounts).

After Lesson 8, have your student refer back to this Chapter Opener and find the answer. The total cost is $32.75. Students can add all the numbers at once, adding in each place, looking for ways to make ten.

If you want, you can then discuss a method for adding columns of numbers (just for fun). Add the digits one by one, making a mark for a ten, and only remembering the ones to add to the next number. For example, 9 + 9 = 18, mark a ten. 8 + 5 = 13, mark a ten. 3 + 9 = 12, mark a ten. 2 + 9 = 11, mark a ten. 1 + 9 = 10, mark a ten. 5 is left. There are 5 marks, so write 5 above the next column. Then continue with the tenths column. 5 + 5 = 10, mark a 10. 9 + 8 = 17, mark a ten. 7 + 7 = 14, mark a ten. 4 + 6 = 10, mark a ten. 6 + 9 = 15, mark a ten. 5 + 2 = 7, so the digit in the hundredths place is 7 and there are 5 ones (5 marks). Continue with the next place. The ones are written here when adding the digits in the hundredths column in this example for illustration purposes only; it is not necessary to write them down, just add them to the next number:

```
   5 5
   9.5 0
   4.9 9
   3.8 9  8
   2.7 5  3
   5.6 9  2
   2.6 9  1
   1.9 9
   1.2 5
 -------
 3 2.7 5
```

Lesson 1 Adding and Subtracting Tenths (pp. 106–108)

Think (p. 106)

Have your student find the answers. They should not have much difficulty.

Learn (p. 106)

This shows with fraction squares that we can simply add tenths or subtract tenths.

Do (pp. 107–108)

These problems show place-value discs instead of fractions for tenths as was done in Learn. Your student should be familiar with addition using place-value discs and it is unlikely they need to use physical discs, but you can have them show the steps with actual discs if needed.

1, 2 Point out that we can add 4 tenths and 2 tenths using the addition fact 4 + 2, just like we could when adding 4 tens and 2 tens, or 4 hundreds and 2 hundreds. Similarly, we can subtract 2 tenths from 4 tenths using the subtraction fact for 4 – 2.

3, 4, 5, 6 When adding in the tenths place, we may need to rename 10 tenths as 1, and when subtracting in the tenths place we may have to rename 1 as 10 tenths. This is similar to what we do when adding or subtracting in any place with whole numbers.

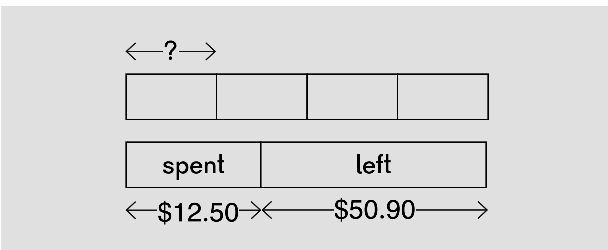
7 Students should solve these mentally, using the same strategies they used for whole numbers.

Answers

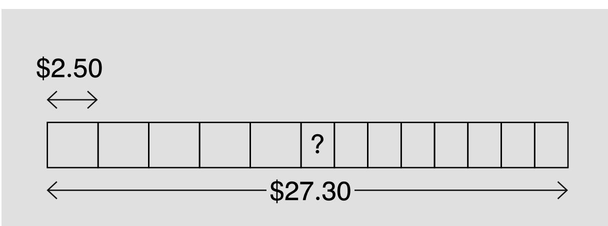
0.8 L
0.2 L

1. **6** tenths
   0.6
2. **2** tenths
   0.2
3. **1** one
   1
4. **7** tenths
   0.7
5. **1** one **3** tenths
   1.3
6. **6** tenths
   0.6
7. (a) 1.4 (b) 1.1
   (c) 0.2 (d) 1.2
   (e) 0.6 (f) 0.7
8. **0.8 km**
   0.4 + 0.3 = 0.7
   1.5 – 0.7 = 0.8

⓬ If necessary, explain that "per" means "for each" and assumes that the quantity is the same for each. How much he made per hour means how much he made each hour. Students may draw a model, such as the following.



⓭ Students may draw a model, such as the following.



Answers (continued)

⓾ $15.30
$25.50 × 3 = $76.50
$76.50 ÷ 5 = $15.30

⓫ **$115.44**
1 stool: $76.96 ÷ 4 = $19.24
6 stools: $19.24 × 6 = $115.44

⓬ $15.85
Total: $12.50 + $50.90 = $63.40
Each hour: $63.40 ÷ 4 = $15.85

⓭ **$1.85**
Money from necklaces:
$2.50 × 5 = $12.50
Total from bracelets:
$27.30 – $12.50 = $14.80
Price for each bracelet:
$14.8 ÷ 8 = $1.85

Enrichment

If your student knows that there can be more decimal places to the right (Enrichment, Lesson 9, Chapter 13) and is proficient with division, you can let them investigate non-terminating decimal quotients. For example, you can ask them to find the quotient for expressions such as:

- 8.8 ÷ 3
- 35 ÷ 6
- 64 ÷ 7
- 56.3 ÷ 9
- 64 ÷ 7

Or, simply:

- 10 ÷ 3
- 10 ÷ 6
- 10 ÷ 7
- 10 ÷ 9

They will have to keep adding new places, and should eventually see a pattern and realize there will always be a remainder. In such cases, in order to express the quotient as an exact answer, we need to use fractions. For example, $10 \div 7 = 1\frac{3}{7}$, instead of 1.42857142... We can also give an approximate answer by rounding to a specific place.

Lesson 1 The Size of Angles (pp. 172–176)

Think (p. 172)

Use the first page of the **Lesson 15-1** printout. You can use either the first set of circles, with a radius already drawn, or the second set, and have your student fold the circles into fourths to find the center and mark a radius to cut along. You can let them color the two circles different colors before cutting them out. If necessary, tell your student that a line from the center of the circle to the edge is called a radius (plural radii). Have them experiment with turning one circle relative to the other. Point out that the radii formed by the two cut edges make an angle. Have your student do the activity in Think and find the answer. They should already know what a right angle looks like and which angle of the set square is a right angle.

Answers

2 (a) obtuse (b) right (c) acute
(d) right (e) acute (f) obtuse

3 (a) a: acute b: acute c: right
d: acute e: acute f: right

(b) 45° $\frac{1}{2} \times 90° = 45°$

(c) 30° $\frac{1}{3} \times 90° = 30°$

(d) 60° $\frac{1}{3} \times 180° = 60°$

4 30° 60° 90° 45°

5 **225°**
$\frac{1}{8} \times 360° = 45°$
$5 \times 45° = 225°$

Learn (p. 173)

Discuss this material. Remind your student that the point where the two lines meet is called the vertex. Point out that the angle formed by a half turn is a straight line is called a straight angle. Any point along a straight line could be the vertex of a straight angle.

Do (pp. 174–176)

3 Use three copies of the **Set Squares** printout. You can mark the angles to match those in (a). Have your student write the angle measurement of each angle on each set square once they determine it. They can either find the measurements by thinking in terms of fractions, or by thinking in terms of units and dividing 90° or 360° by the number of equal units.

4 You can use the second page of the **Lesson 15-1** printout, if larger figures will help.

5 If your student does not know how to begin, point out that there are 8 equal angles and suggest that they find the measure of one of the eight angles.

Have your student also find the number of degrees in $\frac{3}{8}$ of a turn (135°) and $\frac{7}{8}$ of a turn (315°).

Lesson 4 Quadrilaterals (pp. 210–214)

Think (p. 210)

This is a simplified picture of the streets in the Chapter Opener, highlighting six specific quadrilaterals. Your student may remember from the Chapter Opener which angles are right angles but can check any they are not sure of, such as the ones along the bottom. For each problem, have your student first locate the highlighted shape that meets the criteria, and then any others they can find.

Learn (p. 211)

The shapes shown here are the same ones as the highlighted shapes in Think. Make sure your student understands the symbols used to show equal sides, parallel sides, and right angles. When there are two pairs of parallel sides, the second pair is marked with a double arrow. Ask your student some questions based on the defining attributes of the shapes. For example:

- What do you know is true about the rhombus and the rectangle from the statement that they are parallelograms? (They have two pairs of parallel sides.)
- What in the definition supplied about the square makes it a parallelogram? (It is a rhombus, and a rhombus is a parallelogram.)
- Why is a square a rectangle? (It has four right angles, which is the definition of a rectangle.)
- Is a rectangle a rhombus? (It is not, since the definition of a rhombus is just a parallelogram with 4 equal sides.)

Answers

❷ The shapes with the green outline and the purple outline are rhombuses.

❸ (a) AB = DC, AD = BC
(b) They are the same length.
(c) No.

❹ AB || DC EF || HG
AD || BC EH || FG

❺ KL || NM PS || QR

❻ BCIH and CDEI are trapezoids.
CDEI is a parallelogram.

- Could a rectangle be a rhombus? (Yes, and it would then also be a square.)
- Which of the shapes are trapezoids? (All of them except the one at the top.)

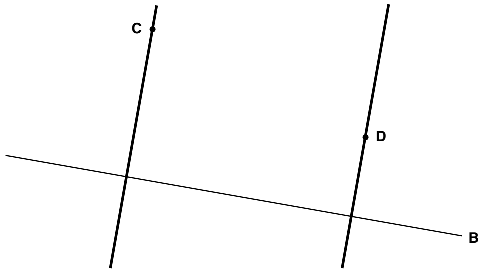
Do (pp. 212–214)

❹ ❺ ❻ Students do not have to verify that lines that look parallel or perpendicular really are, because of the givens. For example, ❹ states that the two figures are parallelograms, and ❻ states that the figure contains two trapezoids. For ❻, it should be obvious that HI and FE are not parallel but students could count squares. You can tell your student there are only two trapezoids in the diagram.

Chapter 16 Workbook Answers

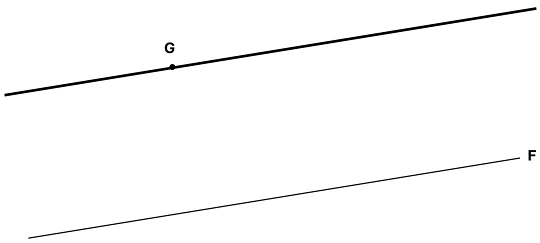
Exercise 3 pp. 162–165

1 (a)

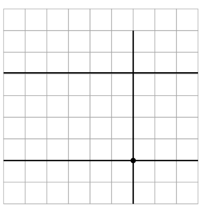


(b) Yes

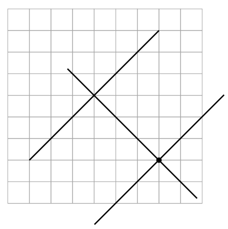
2



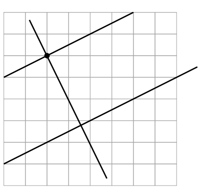
3 (a)



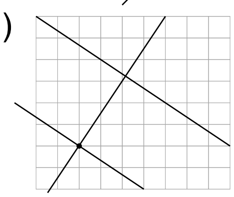
(b)



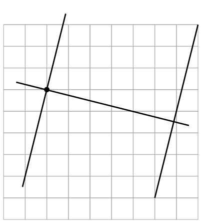
(c)



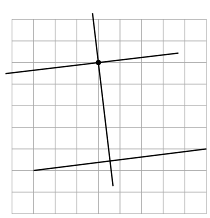
(d)



(e)

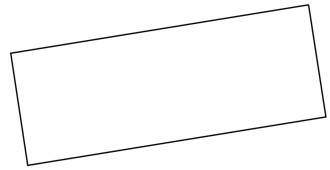


(f)

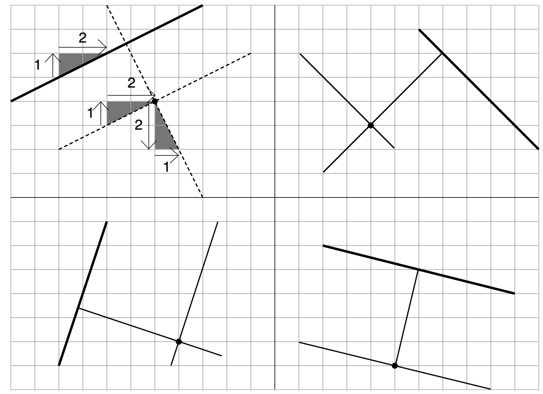


4 GH || QR
IJ || MN
KL || ST

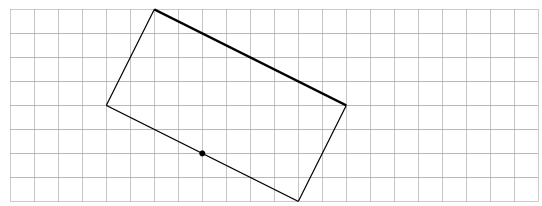
5



6

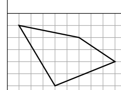
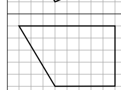
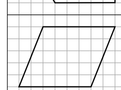
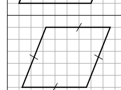
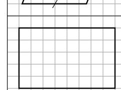
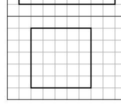


7



Exercise 4 pp. 166–169

1

	Trapezoid	Parallelogram	Rhombus	Rectangle	Square
					
	✓				
	✓	✓			
	✓	✓	✓		
	✓	✓		✓	
	✓	✓	✓	✓	✓

Chapter 16 Workbook Answers

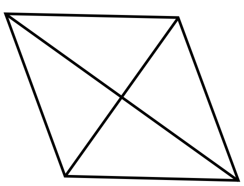
2. Quadrilateral:
   A, B, C, D, E, G, H, I, J
   Trapezoid:
   A, C, D, E, G, H, I
   Parallelogram:
   A, C, D, H, I
   Rhombus:
   D, H
   Rectangle:
   A, D
   Square:
   D

3. Check drawings.

4. Trapezoids: ABGF, GDEF
   Parallelograms: ABGF, GDEF
   Rhombus: ABGF

5. DE = EB
   AE = EC

6. A rhombus

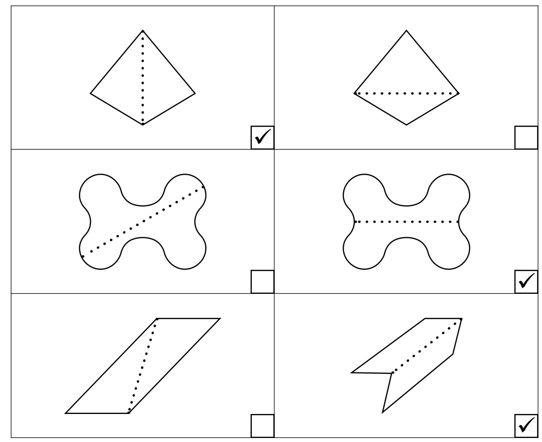


The term midpoint has not been formally defined, but most students should understand it intuitively. If necessary, tell your student the midpoint is the point half way between the two endpoints, or half the distance along the line.

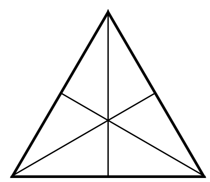
7. Check drawings. Students should start by drawing two lines that intersect at their midpoints, and then connect the endpoints.

Exercise 5 pp. 170–173

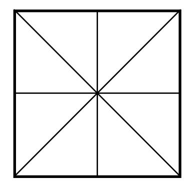
1. The first figure does not show a line of symmetry. The other two do.

2. 

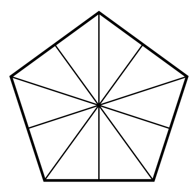
3. (a) 3



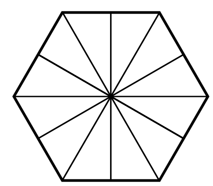
(b) 4



4. (a) 5

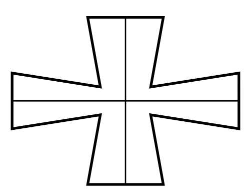


(b) 6



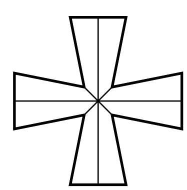
Students may notice that for regular convex pentagons (all the sides and angles are the same, interior angels are all less than 90º), the number of diagonals equals the number of sides.

5. (a)



2 lines of symmetry

(b)



4 lines of symmetry