Dimensions Math®
Textbook 5B



Singapore Math Inc.

Dimensions Math® Textbook 5B

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Preface

The Dimensions Math® Pre-Kindergarten to Grade 5 series is based on the pedagogy and methodology of math education in Singapore. The curriculum develops concepts in increasing levels of abstraction, emphasizing the three pedagogical stages: Concrete, Pictorial, and Abstract. Each topic is introduced, then thoughtfully developed through the use of problem solving, student discourse, and opportunities for mastery of skills.

Features and Lesson Components

Students work through the lessons with the help of five friends: Emma, Alex, Sofia, Dion, and Mei. The characters appear throughout the series and help students develop metacognitive reasoning through questions, hints, and ideas.

The colored boxes  and blank lines in the textbook lessons are used to facilitate student discussion. Rather than writing in the textbooks, students can use whiteboards or notebooks to record their ideas, methods, and solutions.

Chapter Opener

Each chapter begins with an engaging scenario that stimulates student curiosity in new concepts. This scenario also provides teachers an opportunity to review skills.

Think

Students, with guidance from teachers, solve a problem using a variety of methods.

Learn

One or more solutions to the problem in **Think** are presented, along with definitions and other information to consolidate the concepts introduced in **Think**.

Do

A variety of practice problems allow teachers to lead discussion or encourage independent mastery. These activities solidify and deepen student understanding of the concepts.

Exercise

A pencil icon ▸ at the end of the lesson links to additional practice problems in the workbook.

Practice

Periodic practice provides teachers with opportunities for consolidation, remediation, and assessment.

Review

Cumulative reviews provide ongoing practice of concepts and skills.



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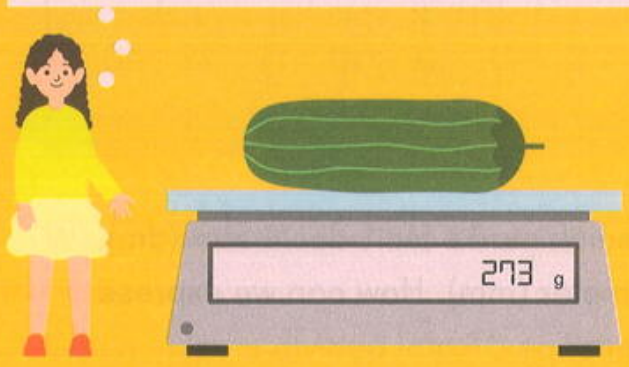
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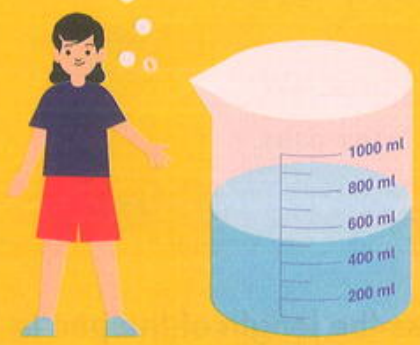
Chapter 9

Decimals

I wonder how much this cucumber weighs in kilograms.



I wonder what the volume is in liters.



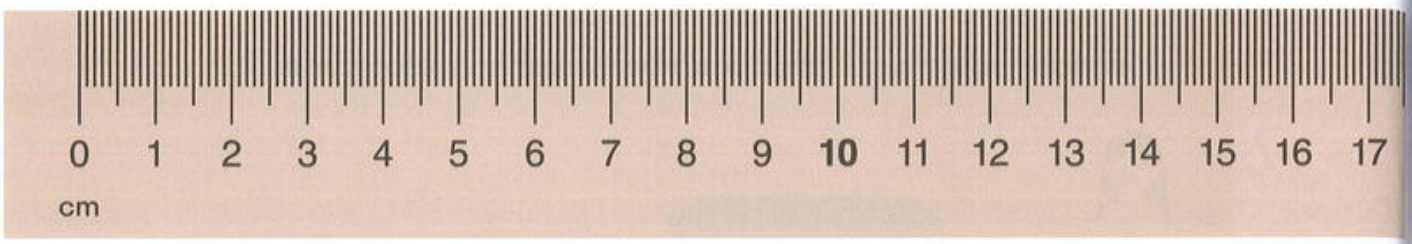
I wonder how long the ribbon is in meters.



Lesson 1
Thousandths

1

Think

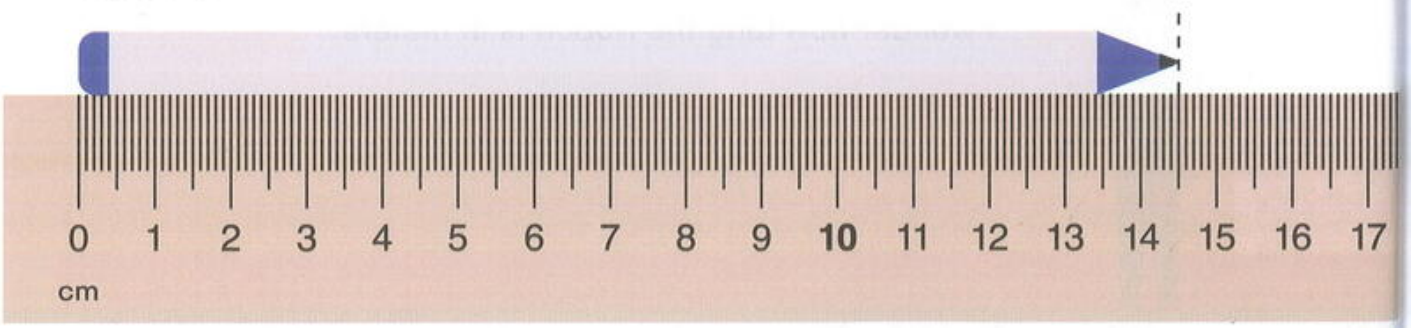


(a) Look at a meter stick. Find the tick marks for 1 decimeter (dm), 1 centimeter (cm), and 1 millimeter (mm). How can we express 1 dm, 1 cm, and 1 mm in meters?



10 dm = 1 m
100 cm = 1 m
1,000 mm = 1 m

(b) This pen is 145 mm long. How can we express the length of the pen in meters?

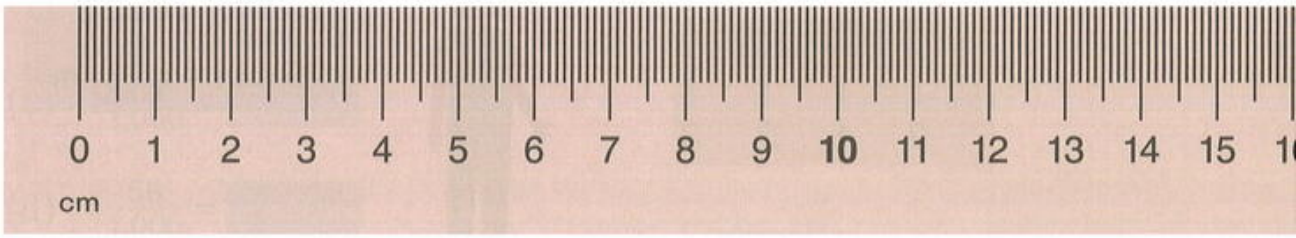


Learn

(a) $1 \text{ mm} = \frac{1}{1{,}000} \text{ m} = 0.001 \text{ m}$

$1 \text{ cm} = \frac{1}{100} \text{ m} = 0.01 \text{ m}$

$1 \text{ dm} = \frac{1}{10} \text{ m} = 0.1 \text{ m}$



When 1 m is divided into 10 equal parts, each part is $\frac{1}{10}$ m, or 0.1 m.

When $\frac{1}{10}$ m is divided into 10 equal parts, each part is $\frac{1}{100}$ m, or 0.01 m.

When $\frac{1}{100}$ m is divided into 10 equal parts, each part is $\frac{1}{1{,}000}$ m, or 0.001 m.



We read 0.001 as **zero point zero zero one** or **one thousandth.**

(b) $145 \text{ mm} = \frac{145}{1{,}000} \text{ m} = 0.145 \text{ m}.$

The pen is _____ m long.



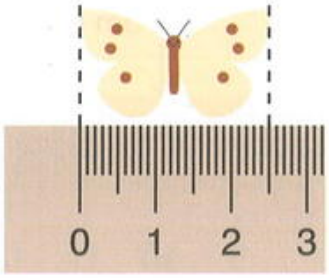
We read 0.145 as **zero point one four five** or **one hundred forty-five thousandths.**



How can we express the length of the pen in centimeters?

Do

1 (a) Express the length of the moth's wingspan in meters as a decimal.



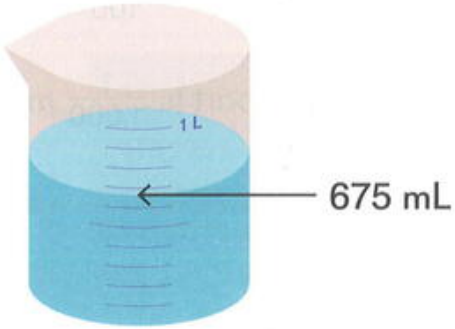


$1 \text{ mm} = \frac{1}{1{,}000} \text{ m}$

$25 \text{ mm} = \frac{25}{1{,}000} \text{ m}$

25 mm = ☐ m

(b) Express the amount of water in the beaker in liters as a decimal.



$1 \text{ mL} = \frac{1}{1{,}000} \text{ L}$

675 mL = ? L



675 mL = ☐ L

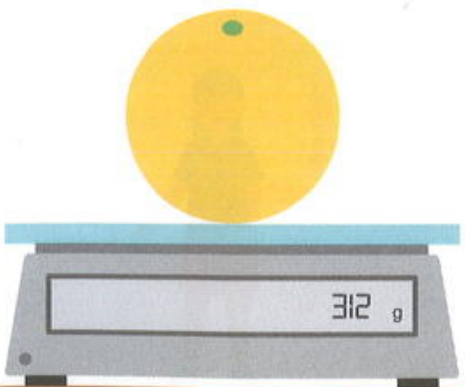
(c) Express the weight of the grapefruit in kilograms as a decimal.



$1 \text{ g} = \frac{1}{1{,}000} \text{ kg}$

312 g = ? kg

312 g = ☐ kg



2 Express each fraction or mixed number as a decimal.

(a) $\frac{9}{1,000} =$ ☐

(b) $\frac{45}{1,000} =$ ☐

(c) $1\frac{708}{1,000} =$ ☐

(d) $4\frac{58}{1,000} =$ ☐

3 Express each fraction as a decimal.

(a) $\frac{70}{1,000} =$ ☐



$\frac{70}{1,000} = \frac{7}{100}$

(b) $\frac{300}{1,000} =$ ☐

$\frac{300}{1,000} = \frac{30}{100} = \frac{3}{10}$



(c) $\frac{29}{500} =$ ☐

$\frac{29}{500} \overset{\times ?}{=} \frac{?}{1,000}$



4 Express each mixed number as a decimal.

(a) $2\frac{3}{4} =$ ☐



4 is not a factor of 10, but it is a factor of 100. $4 \times 25 = 100$

(b) $5\frac{1}{8} =$ ☐



8 is not a factor of 10, or 100, but it is a factor of 1,000. $8 \times ? = 1{,}000$

5 Express 0.008 as a fraction in simplest form.



$$\frac{8}{1{,}000} \overset{\div 2}{=} \frac{4}{500} \overset{\div 2}{=} \frac{2}{250} \overset{\div 2}{=} \frac{?}{?}$$

$$\frac{8}{1{,}000} \overset{\div ?}{=} \frac{?}{?}$$



$0.008 =$ ☐/☐

6 (a) Express 2.375 as a fraction in simplest form.

$$\frac{375}{1{,}000} \overset{\div 5}{=} \frac{75}{200} \overset{\div 25}{=} \frac{?}{?}$$



$2.375 = \square\frac{\square}{\square}$

(b) Express 1.525 as a fraction in simplest form.



$$\frac{525}{1{,}000} \overset{\div ?}{=} \frac{?}{?}$$

$1.525 = \square\frac{\square}{\square}$

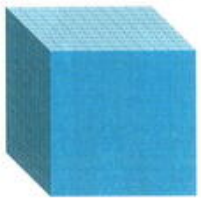
7 Express each fraction or mixed number as a decimal.

(a) $3\frac{2}{5}$ (b) $\frac{179}{250}$ (c) $6\frac{7}{8}$

8 Express each decimal as a fraction or mixed number in simplest form.

(a) 1.25 (b) 0.125 (c) 3.076

Think

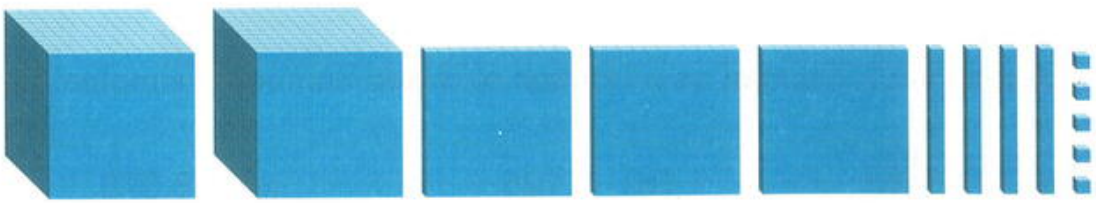
			
Large cube	Flat	Rod	Small cube



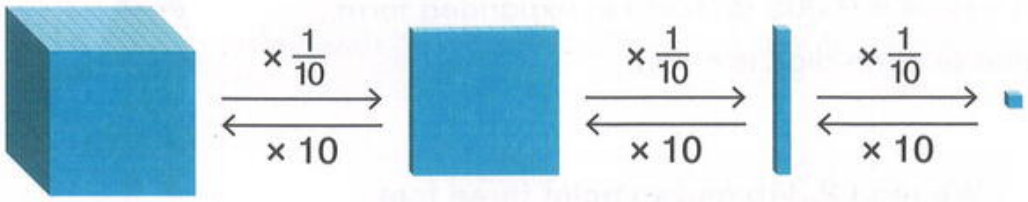
10 flats = 1 large cube
100 rods = 1 large cube
1,000 small cubes = 1 large cube

(a) If we consider the value of the large cube as 1, how can we express the values of the flat, the rod, and the small cube?

(b) If we consider the value of the large cube as 1, what is the value of the blocks shown below?



Learn

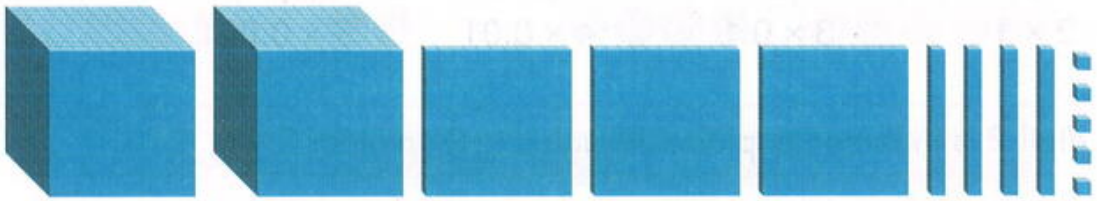
(a) 

1

$\frac{1}{10}$ of 1 is 0.1. 

$\frac{1}{10}$ of $\frac{1}{10}$ of 1 is $\frac{1}{100}$ of 1, or 0.01. 

$\frac{1}{10}$ of $\frac{1}{10}$ of $\frac{1}{10}$ of 1 is $\frac{1}{1,000}$ of 1, or 0.001.

(b) 

We can express the value as a fraction.

$$(2 \times 1) + (3 \times \tfrac{1}{10}) + (4 \times \tfrac{1}{100}) + (5 \times \tfrac{1}{1,000}) = 2 + \tfrac{300}{1,000} + \tfrac{40}{1,000} + \tfrac{5}{1,000}$$

$$= 2\,\tfrac{345}{1,000}$$

We can express the value as a decimal.

$$(2 \times 1) + (3 \times 0.1) + (4 \times 0.01) + (5 \times 0.001) = 2 + 0.3 + 0.04 + 0.005$$

$$= 2.345$$

$2 + 0.3 + 0.04 + 0.005$ is 2.345 in expanded form. The value of each digit is given.





We read 2.345 as **two point three four five**. We could also read it as **two and three hundred forty-five thousandths.**



Ones	Tenths	Hundredths	Thousandths
2	3	4	5
2×1	3×0.1	4×0.01	5×0.001

The digit 2 is in the ones place. Its value is 2 ones, or 2.

The digit 3 is in the tenths place. Its value is 3 tenths, or 0.3.

The digit 4 is in the hundredths place. Its value is 4 hundredths, or 0.04.

The digit 5 is in the thousandths place. Its value is 5 thousandths, or 0.005.

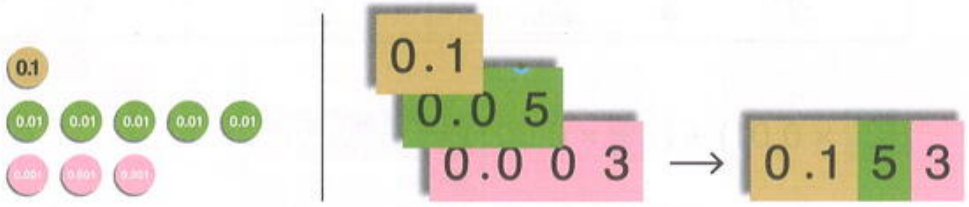
There are other place values to the right of the thousandths place such as the **ten thousandths** place, the **hundred thousandths** place, and the **millionths place.**



Do

1 Make each number with place value discs and place value cards.

(a) 0.153



0.1 + 0.05 + 0.003 = ☐

(b) 0.032

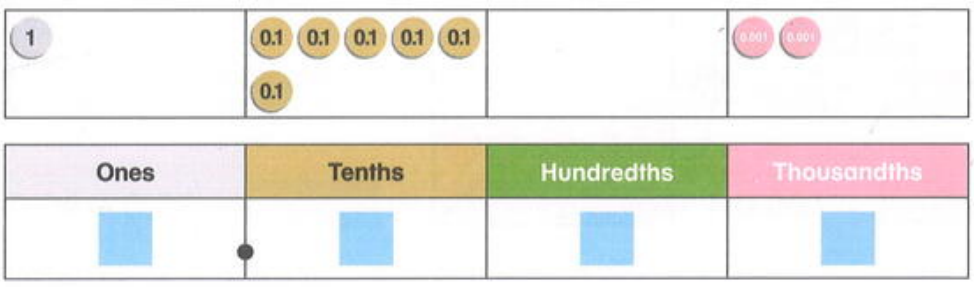
(c) 3.006

2 (a)



(3 × 1) + (2 × 0.1) + (4 × 0.01) + (5 × 0.001) = ☐

(b)



(☐ × 1) + (☐ × 0.1) + (☐ × 0.001) = ☐

(c)

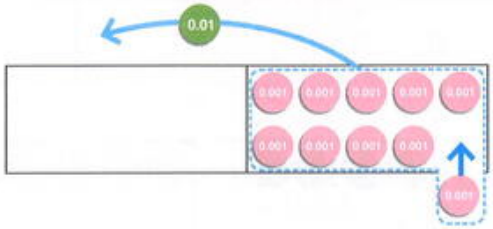


(☐ × 0.01) + (☐ × 0.001) = ☐

3 (a) What number is 0.001 more than 0.009?

9 thousandths + 1 thousandth = 10 thousandths



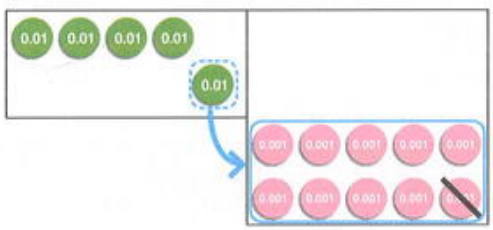


0.009 + 0.001 = ☐

(b) What number is 0.001 less than 0.05?

5 hundredths = 4 hundredths + 10 thousandths



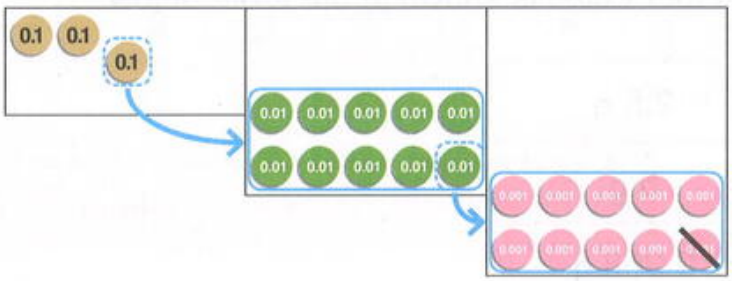


0.05 − 0.001 = ☐

(c) What number is 0.001 less than 0.3?

3 tenths = 2 tenths + 9 hundredths + 10 thousandths





0.3 – 0.001 = ____

4 Write the following numbers in expanded form.

(a) 0.425

(b) 2.302

(c) 31.008

(d) 403.062

5 (a) 7 + 0.03 + 0.005 = ____

(b) 0.07 + 3 + 0.5 + 0.002 = ____

6 (a) 0.9 + 0.1 = ____

(b) 0.003 + 0.007 = ____

(c) 0.04 + 0.06 = ____

(d) 0.07 – 0.001 = ____

(e) 0.3 – 0.01 = ____

(f) 0.2 – 0.003 = ____

Exercise 2 • page 5

Lesson 3
Comparing Decimals

3

Think

The weight in grams of four coins is shown in the table below.

penny	2.5 g
nickel	5 g
dime	2.268 g
quarter	5.67 g

Compare the weights of the coins. Then order the coins from lightest to heaviest.

Learn

Compare the weights of the penny and the nickel.

	Ones	Tenths	Hundredths	Thousandths
penny	2	5		
nickel	5			

Begin by comparing the digits in the highest place.
2 ones < 5 ones



$2.5 < 5$

The penny weighs less than the nickel.

Compare the weights of the penny and the dime.

	Ones	Tenths	Hundredths	Thousandths
penny	2	5		
dime	2	2	6	8

The ones are the same, so compare the tenths.
5 tenths > 2 tenths



$2.268 = 2\frac{268}{1,000}$

$2.5 = 2\frac{500}{1,000}$



$2.5 > 2.268$

The dime weighs less than the penny.

Compare the weights of the nickel and the quarter.

	Ones	Tenths	Hundredths	Thousandths
nickel	5			
quarter	5	6	7	

6 tenths > 0 tenths



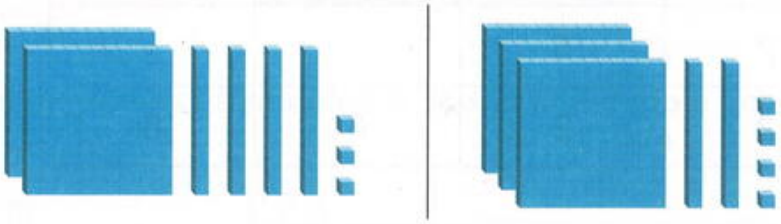
$5 < 5.67$

The nickel weighs less than the quarter.

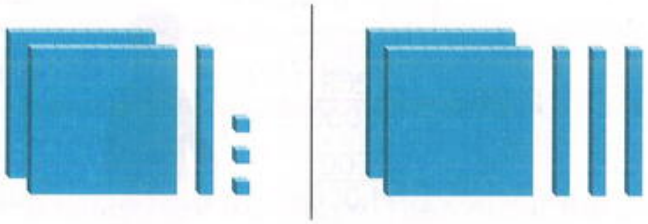
The coins in order from lightest to heaviest are _____, _____, _____, and _____.

Do

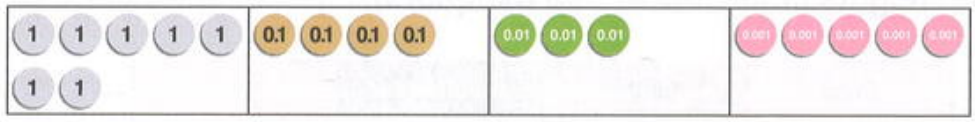
1 (a) Which is greater, 0.243 or 0.324?



(b) Which is less, 0.213 or 0.23?



2 Compare 7.435 and 7.379.



Ones	Tenths	Hundredths	Thousandths
7	4	3	5



Ones	Tenths	Hundredths	Thousandths
7	3	7	9

7.435 ◯ 7.379

3 (a) Compare 0.03 and 0.031.

Ones	Tenths	Hundredths	Thousandths
0	0	3	
0	0	3	1



0 thousandths < 1 thousandth

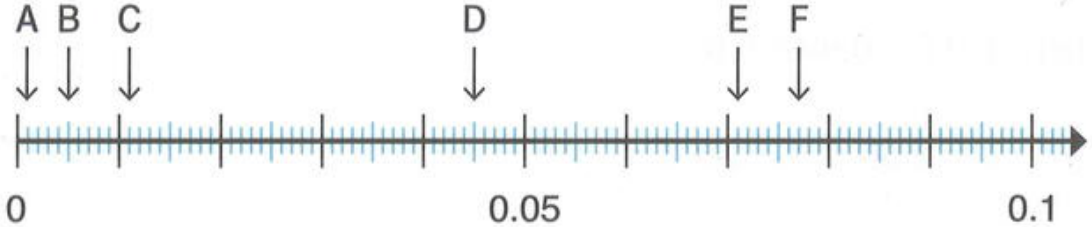
0.03 ◯ 0.031

(b) Compare 5.246 and 5.25.

Ones	Tenths	Hundredths	Thousandths
5	2	4	6
5	2	5	

5.246 ◯ 5.25

4 Write the numbers represented by each arrow. Which number is the least? Which number is the greatest?



5 Find the location of the following numbers on the number line. Then write them in order from least to greatest.



(a) 1.425 (b) 1.475

(c) 1.42 (d) 1.47

6 What sign, >, <, or =, goes in each ◯?

(a) 0.417 ◯ 0.403 (b) 0.279 ◯ 0.379

(c) 1.235 ◯ 1.238 (d) 1.2 ◯ 1.02

(e) 3.24 ◯ 3.240 (f) 0.075 ◯ 0.3

(g) 3 + 0.02 ◯ 3 + 0.005 (h) 5 + 0.07 ◯ 5 + 0.6 + 0.009 + 0.001

7 Order the numbers from least to greatest.

(a) 0.1, 0, 1, 0.5, 0.015

(b) 2.784, 2.8, 2.78, 2.7

(c) 9, 0.99, 0.999, 9.9

(d) 3.1, 3.05, 3.15, 3.015

Exercise 3 • page 9

Lesson 4
Rounding Decimals

4

Think

The length of the paper clip is 1.375 in.



(a) Round 1.375 to the second decimal place.

(b) Round 1.375 to the first decimal place.

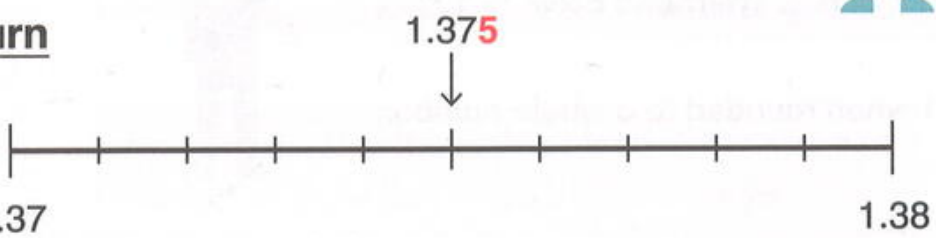
(c) Round 1.375 to a whole number.

"Round to the first decimal place" means round to the nearest tenth. "Round to the second decimal place" means round to the nearest hundredth.



Learn

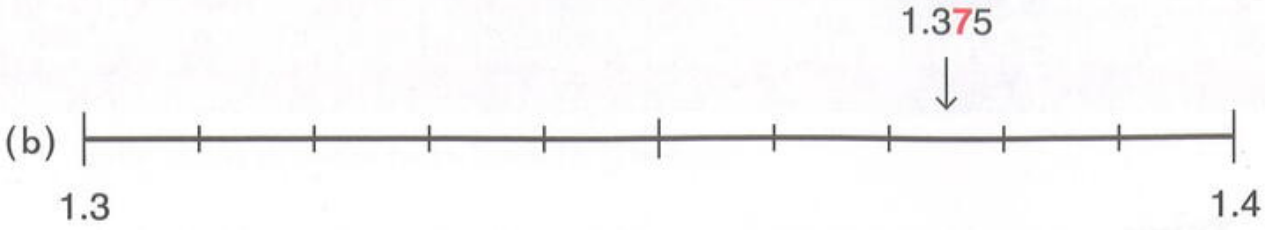
(a)





A digit of 5 in the thousandths place tells us that the number 1.375 is halfway between 1.37 and 1.38. We round up to 1.38.

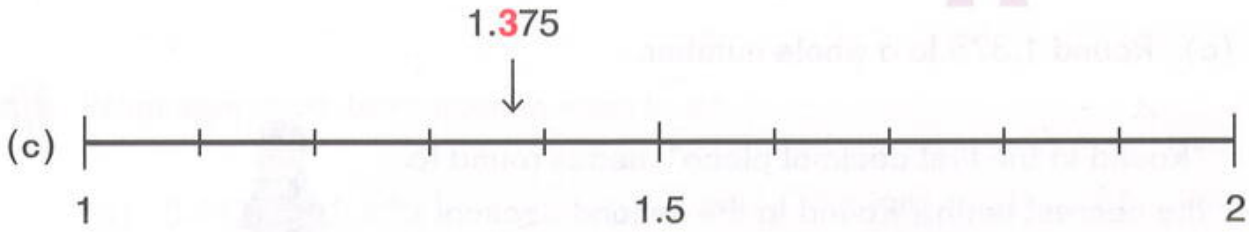
1.375 is 1.38 when rounded to the second decimal place.



A digit of 7 in the hundredths place tells us that the number 1.375 is more than halfway between 1.3 and 1.4. We round up to 1.4.



1.375 is 1.4 when rounded to the first decimal place.



A digit of 3 in the tenths place tells us that the number 1.375 is less than halfway between 1 and 2. We round down to 1.



1.375 is 1 when rounded to a whole number.

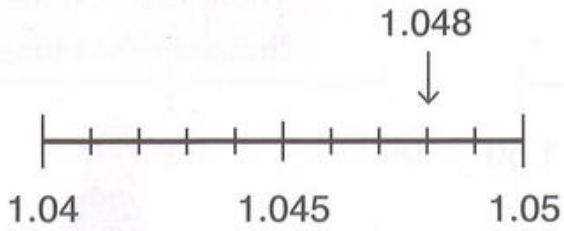


Which estimate is closer to the actual measurement, 1.38 inches, 1.4 inches, or 1 inch?

To round decimal numbers to a given place, look at the digit that is one place to the right of the place you are rounding to. If it is 0, 1, 2, 3, or 4, round down. If it is 5, 6, 7, 8, or 9, round up.

Do

1 (a) Round 1.048 to the second decimal place.

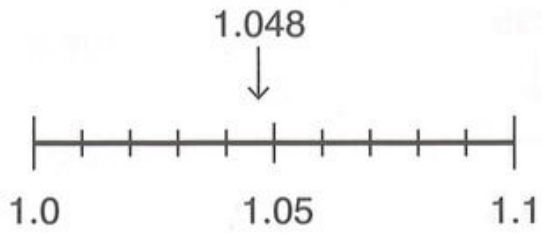


1.048 is closer to...



1.048 is _____ when rounded to the second decimal place.

(b) Round 1.048 to the first decimal place.

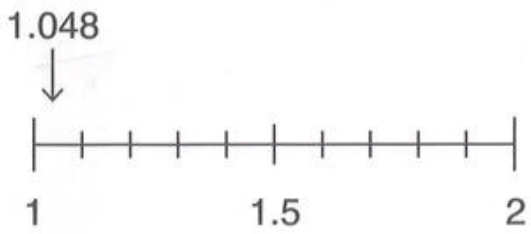


1.048 is _____ when rounded to the first decimal place.

We keep the 0 in the tenths place of the rounded number to show that we rounded to tenths.

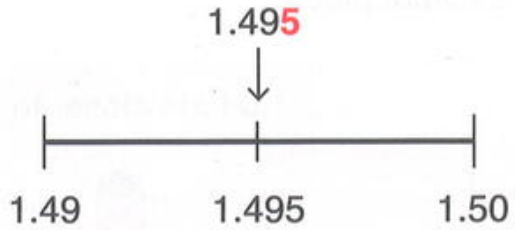


(c) Round 1.048 to the nearest whole number.



1.048 is _____ when rounded to the nearest whole number.

2 (a) Round 1.495 to the second decimal place.

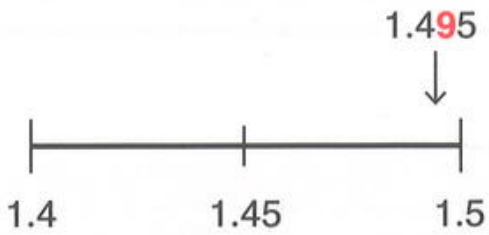


$1.495 \approx$ ☐

There is a 5 in the thousandths place so...

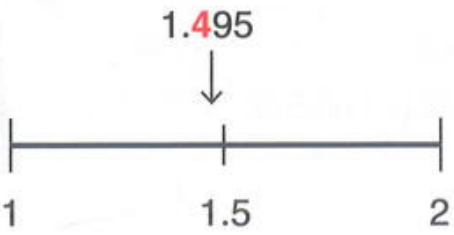


(b) Round 1.495 to the first decimal place.



$1.495 \approx$ ☐

(c) Round 1.495 to a whole number.

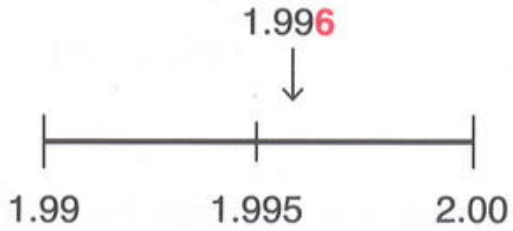


$1.495 \approx$ ☐

There is a 4 in the tenths place so...



3 Round 1.996 to the second decimal place.



$1.996 \approx$ ____

We write zeros in the tenths and hundredths places of the rounded number to show that we rounded to hundredths, not to a whole number.



4 Round each number to the second decimal place.

(a) 3.801

(b) 4.325

(c) 10.503

(d) 52.095

5 Round each number to the first decimal place.

(a) 0.619

(b) 5.071

(c) 45.014

(d) 20.972

6 Round each number to a whole number.

(a) 1.503

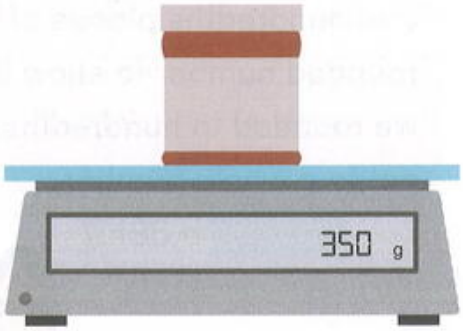
(b) 26.009

(c) 9.536

(d) 99.701

Exercise 4 • page 12

1



Express the weight of the jar of chocolate spread as a decimal in kilograms.

2 Express each fraction or mixed number as a decimal.

(a) $\frac{3}{1{,}000}$ (b) $\frac{502}{1{,}000}$ (c) $1\frac{243}{500}$ (d) $3\frac{17}{125}$

3 Express each decimal as a fraction or mixed number in simplest form.

(a) 0.005 (b) 0.275

(c) 2.808 (d) 1.405

4 (a) $2 + 0.1 + 0.003 =$ ____

(b) $(3 \times 0.1) + (2 \times 0.01) + (7 \times 0.001) =$ ____

(c) ____ $= 0.004 + 0.006$

(d) $0.4 - 0.001 =$ ____

5 Write the following numbers in expanded form.

(a) 0.305

(b) 20.062

6 What sign, >, <, or =, goes in each ◯?

(a) 3.4 ◯ 3.296

(b) 0.74 ◯ 0.751

(c) 0.909 ◯ 0.099

(d) 0.06 ◯ 0.060

7 Order the numbers from least to greatest.

(a) 1, 0.1, 0, 0.01, 0.001

(b) 0.1, 0, 0.09, 0.089

(c) 0.04, 4.04, 0.44, 0.404

(d) 3, 0.329, 0.3, 0.29

(e) $\frac{1}{4}$, 0.27, 0.245, 2.5

(f) $4\frac{1}{2}$, 4, $4\frac{123}{250}$, 4.9

8 Round each number to the second decimal place, to the first decimal place, and to a whole number.

(a) 5.082

(b) 1.916

(c) 54.021

(d) 0.999

9 A decimal number with 4 digits is 2.06 when rounded to the second decimal place. What are the possible values of the number?

Exercise 5 • page 15

Lesson 6
Multiply Decimals by 10, 100, and 1,000

6

Think



An action figure weighs 0.231 kg.

(a) How much do 10 of these action figures weigh in kilograms?

(b) How much do 100 of these action figures weigh in kilograms?

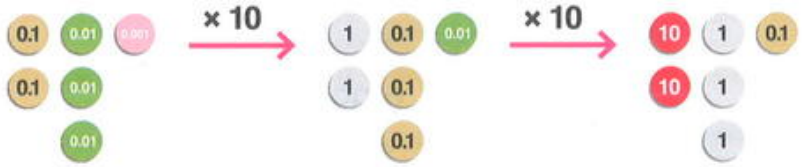
(c) How much do 1,000 of these action figures weigh in kilograms?

Learn

(a) 

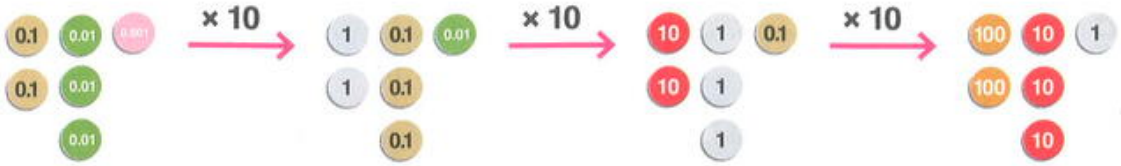
$0.231 \times 10 = 2.31$

10 action figures weigh _____ kg.

(b) 

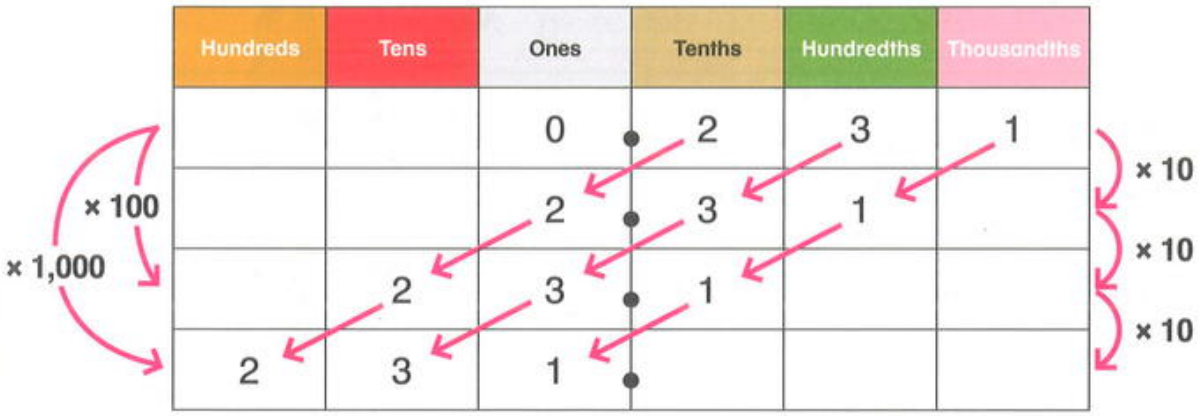
$0.231 \times 10 \times 10 = 0.231 \times 100 = 23.1$

100 action figures weigh _____ kg.

(c) 

$0.231 \times 10 \times 10 \times 10 = 0.231 \times 1{,}000 = 231$

1,000 action figures weigh _____ kg.



$0.231 \times 10 \rightarrow 0.2\,3\,1 \rightarrow 2.31$

$0.231 \times 100 \rightarrow 0.2\,3\,1 \rightarrow 23.1$

$0.231 \times 1{,}000 \rightarrow 0.2\,3\,1 \rightarrow 231$



To multiply a number by 10, 100, or 1,000, move the decimal point 1, 2, or 3 places to the right, respectively.



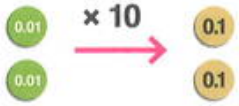
What is 23.1×100?
What is $2.31 \times 1{,}000$?

Do

1 (a) $0.2 \times 10 =$ ☐



(b) $0.02 \times 10 =$ ☐



(c) $0.002 \times 10 =$ ☐



(d) $0.002 \times 100 =$ ☐



(e) $0.002 \times 1{,}000 =$ ☐



2

One Thousands	Hundreds	Tens	Ones	Tenths	Hundredths	Thousandths
			3	2	4	5
		3	2	4	5	
	3	2	4	5		
3	2	4	5			

× 10
× 10
× 10

(a) $3.245 \times 10 =$ ☐

(b) $3.245 \times 100 =$ ☐

(c) $3.245 \times 1{,}000 =$ ☐

(d) $32.45 \times 100 =$ ☐

(e) $32.45 \times 10 =$ ☐

(f) $324.5 \times 10 =$ ☐

3 (a) $1.307 \times 10 =$ ☐



1 . 3 0 7

(b) $1.307 \times 100 =$ ☐



1 . 3 0 7

(c) $1.307 \times 1{,}000 =$ ☐



1 . 3 0 7

4 Multiply.

(a) 0.25×10 (b) 0.084×10 (c) 0.6×100

(d) 1.35×100 (e) 0.609×100 (f) $4.5 \times 1{,}000$

(g) $0.39 \times 1{,}000$ (h) $1.308 \times 1{,}000$ (i) $25.7 \times 1{,}000$

5 A dime weighs 2.268 g.

(a) How much do 10 dimes weigh in grams?

(b) How much do 100 dimes weigh in grams?

(c) How much do 1,000 dimes weigh in grams?

Exercise 6 • page 18

Lesson 7
Divide Decimals by 10, 100, and 1,000

7

Think

(a) 231 kg of flour is divided equally into 10 containers. How many kilograms of flour are in each container?

(b) 231 kg of coffee is divided equally into 100 bags. How many kilograms of coffee are in each bag?

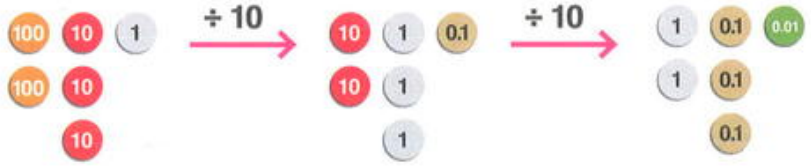
(c) 231 kg of cinnamon is divided equally into 1,000 bottles. How many kilograms of cinnamon are in each bottle?

Learn

(a) 

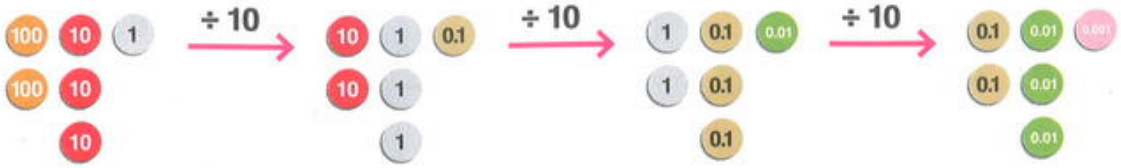
$231 \div 10 = 23.1$

There are _____ kg of flour in each container.

(b) 

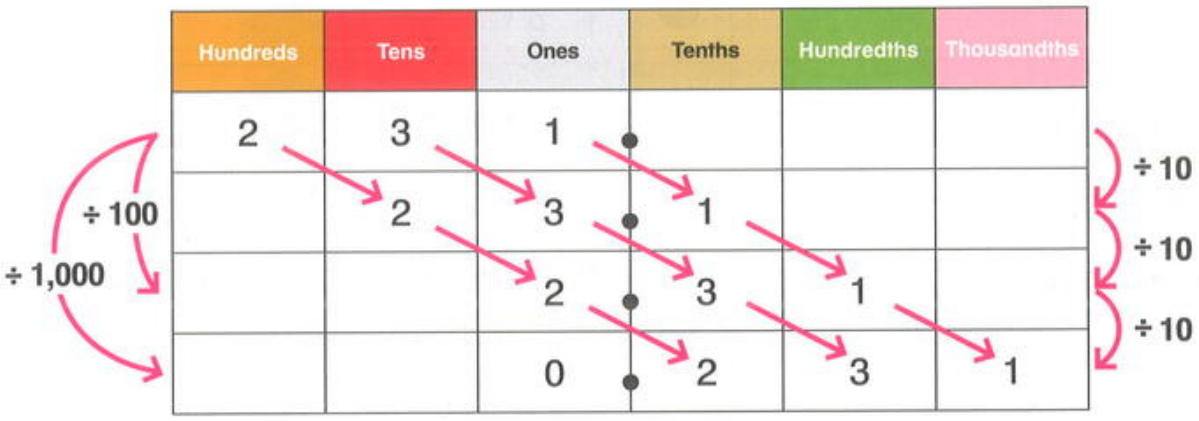
$231 \div 10 \div 10 = 231 \div 100 = 2.31$

There are _____ kg of coffee in each bag.

(c) 

$231 \div 10 \div 10 \div 10 = 231 \div 1{,}000 = 0.231$

There are _____ kg of cinnamon in each bottle.



$231 \div 10 \rightarrow 2\ 3\ 1. \rightarrow 23.1$

$231 \div 100 \rightarrow 2\ 3\ 1. \rightarrow 2.31$

$231 \div 1{,}000 \rightarrow 2\ 3\ 1. \rightarrow 0.231$



To divide a number by 10, 100, or 1,000, move the decimal point 1, 2, or 3 places to the left, respectively.



What is $2.31 \div 10$?
What is $2{,}310 \div 1{,}000$?

Do

1 (a) $2 \div 10 =$ ☐



(b) $0.2 \div 10 =$ ☐



(c) $0.02 \div 10 =$ ☐



(d) $0.2 \div 100 =$ ☐



(e) $2 \div 1{,}000 =$ ☐



2

Hundreds	Tens	Ones	Tenths	Hundredths	Thousandths
	6	5			
		6	5		
		0	6	5	
		0	0	6	5

÷ 10
÷ 10
÷ 10

(a) $65 \div 10 =$ ☐

(b) $65 \div 100 =$ ☐

(c) $65 \div 1{,}000 =$ ☐

(d) $6.5 \div 10 =$ ☐

(e) $6.5 \div 100 =$ ☐

(f) $0.65 \div 10 =$ ☐

3 (a) $8.03 \div 10 =$ ☐



8.03

(b) $6.2 \div 100 =$ ☐

6.2



(c) $91 \div 1{,}000 =$ ☐



91.

4 Divide.

(a) $1.06 \div 10$ (b) $2.3 \div 10$ (c) $0.9 \div 100$

(d) $63.5 \div 100$ (e) $304.6 \div 100$ (f) $7 \div 1{,}000$

(g) $2.1 \div 100$ (h) $80 \div 1{,}000$ (i) $300 \div 1{,}000$

5 To divide 36 by 100, Mei used the following method.

$36 \div 100 = \frac{36}{100} = 0.36$

(a) Explain why Mei's method works.

(b) Use this method to divide 36 by 1,000.

(c) Use this method to divide 36 by 10.

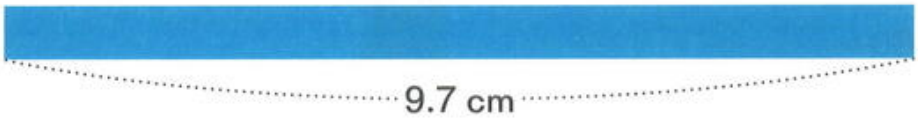
Exercise 7 • page 21

Lesson 8
Conversion of Measures

8

Think

A ribbon is 9.7 cm long.



(a) Express the length of the ribbon in millimeters.

(b) Express the length of the ribbon in meters.

Learn

(a) 1 cm = 10 mm

9.7 × 10 = 97

9.7 cm = ☐ mm

Millimeters are smaller units than centimeters. I multiplied by 10.



(b) 100 cm = 1 m

9.7 ÷ 100 = 0.097

9.7 cm = ☐ m

Meters are larger units than centimeters. I divided by 100.

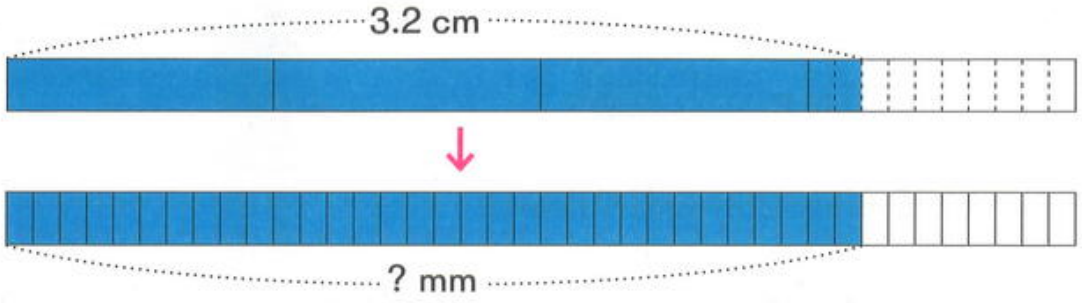


97 mm, 9.7 cm, and 0.097 m are equivalent measures.



Do

1 (a) Express 3.2 cm in millimeters.



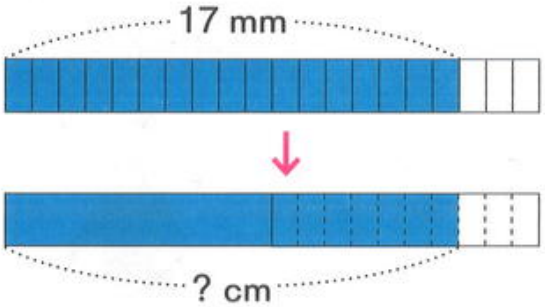
$3.2 \times 10 =$ ☐

$3.2 \text{ cm} =$ ☐ mm

1 cm = 10 mm



(b) Express 17 mm in centimeters.



$17 \div 10 =$ ☐

$17 \text{ mm} =$ ☐ cm

10 mm = 1 cm

1 mm = $\frac{1}{10}$ cm



2 (a) Express 8.25 m in centimeters.

$8.25 \times 100 =$ ☐

8.25 m = ☐ cm

(b) Express 25.4 cm in meters.

$25.4 \div 100 =$ ☐

25.4 cm = ☐ m



1 m = 100 cm

100 cm = 1 m

1 cm = $\frac{1}{100}$ m



3 (a) Express 2.85 kg in grams.

$2.85 \times 1{,}000 =$ ☐

2.85 kg = ☐ g

(b) Express 7.85 km in meters.

$7.85 \times 1{,}000 =$ ☐

7.85 km = ☐ m

1 kg = 1,000 g

1 L = 1,000 mL

1 km = 1,000 m



(c) Express 250 mL in liters.

$250 \div 1{,}000 =$ ☐

250 mL = ☐ L

4 Express 3 kg 450 g in kilograms.

3 kg 450 g = 3 kg + 0.45 kg

= _____ kg



450 g = 0.45 kg

5 (a) 4 L 600 mL = _____ L

(b) 4 L 60 mL = _____ L

6 Find the equivalent measures.

(a) 0.3 m = _____ cm

(b) 16 mm = _____ cm

(c) 1.2 L = _____ mL

(d) 985 mL = _____ L

(e) 3.75 cm = _____ mm

(f) 1,200 m = _____ km

(g) 0.9 kg = _____ g

(h) 250 cm = _____ m

(i) 1.2 L = _____ mL

(j) 37.5 cm = _____ m

(k) 3 m 20 cm = _____ m

(l) 5 kg 2 g = _____ kg

7 Dion ran 5 km on Monday, 3.2 km on Tuesday, and 900 m on Wednesday. How many kilometers did he run on all three days altogether?

Exercise 8 • page 24

Lesson 9
Mental Calculation

9

Think

(a) Use mental calculation to multiply 0.23 by 2,000.

(b) Use mental calculation to divide 6.8 by 200.

Learn

(a)



$0.23 \times 2{,}000 = 0.23 \times 2 \times 1{,}000$
23 hundredths × 2 = 46 hundredths = 0.46
$0.46 \times 1{,}000 = 460$

$0.23 \times 2{,}000 =$ ____

(b)



$6.8 \div 200 = 6.8 \div 2 \div 100$
68 tenths ÷ 2 = 34 tenths = 3.4
$3.4 \div 100 = 0.034$

$6.8 \div 200 =$ ____

What other methods could we use?



Do

1 (a) Multiply 0.5 by 300.

5 tenths × 3 = 15 tenths = 1.5
1.5 × 100 = ?



0.5 × 300 = ☐

(b) Multiply 0.005 by 3,000.

0.005 × 3,000 = ☐

2 (a) Divide 0.9 by 300.

9 tenths ÷ 3 = 3 tenths = 0.3
0.3 ÷ 100 = ?



0.9 ÷ 300 = ☐

(b) Divide 0.09 by 30.

0.09 ÷ 30 = ☐

3 Multiply 0.27 by 30.

27 hundredths × 3 = 81 hundredths = 0.81
0.81 × 10 = ?



0.27 × 30 = ☐ × 10 = ☐

4 Divide 4.5 by 300.



45 tenths ÷ 3 = 15 tenths = 1.5
1.5 ÷ 100 = ?

4.5 ÷ 300 = ☐ ÷ 100 = ☐

5 Multiply.

(a) 9 × 7 0.09 × 7 0.09 × 700

(b) 45 × 2 0.045 × 2 0.045 × 2,000

6 Divide.

(a) 56 ÷ 8 5.6 ÷ 8 5.6 ÷ 800

(b) 60 ÷ 5 6 ÷ 5 0.6 ÷ 5 0.6 ÷ 50

7 Find the values.

(a) 0.03 × 300 (b) 0.15 × 20 (c) 0.14 × 600

(d) 2.5 × 4,000 (e) 12 ÷ 4,000 (f) 4.5 ÷ 500

(g) 3.6 ÷ 300 (h) 1.3 × 600 (i) 0.4 ÷ 80

Exercise 9 • page 28

1 Find the values.

(a) 0.8×10 (b) 0.05×100 (c) $0.009 \times 1{,}000$

(d) 0.347×10 (e) 0.086×100 (f) $4.302 \times 1{,}000$

(g) $6.23 \times 1{,}000$ (h) $27.3 \times 1{,}000$ (i) $0.4 \div 10$

(j) $0.7 \div 100$ (k) $3 \div 1{,}000$ (l) $0.69 \div 10$

(m) $30.4 \div 100$ (n) $50 \div 1{,}000$ (o) $1{,}009 \div 1{,}000$

2 Find the values.

(a) 0.002×400 (b) 0.06×500 (c) $2.6 \times 2{,}000$

(d) 0.72×30 (e) $0.8 \div 40$ (f) $54 \div 9{,}000$

(g) $4.2 \div 700$ (h) $0.51 \div 30$ (i) $0.63 \div 90 \times 200$

3 Find the equivalent measures.

(a) 0.6 m = ____ cm (b) 3.85 cm = ____ mm

(c) 2 kg = ____ g (d) 2,500 m = ____ km

(e) 345 cm = ____ m (f) 28 mm = ____ cm

4 (a) 8.375 L = ____ L ____ mL

(b) 8.7 km = ____ km ____ m

(c) 5.8 m = ____ m ____ cm

5 (a) 9 m 60 cm = ____ m (b) 25 km 60 m = ____ km

(c) 10 cm 8 mm = ____ cm (d) 5 kg 5 g = ____ kg

6 The distance around a running track is 0.4 km. Phillip ran around the track 10 times each day for 10 days. How many kilometers did he run?

7 The weight of 100 identical marbles is 16 ounces. How many ounces does one marble weigh?

8 Three packages weigh 1 kg, 0.8 kg, and 0.09 kg, respectively.

(a) What is the total weight of the three packages in kilograms?

(b) What is the total weight of the three packages in kilograms and grams?

9 The total capacity of 500 identical bottles is 250 L. What is the capacity of one bottle in liters?

Exercise 10 • page 31

Chapter 10

The Four Operations of Decimals

What have we learned about decimal operations?

We can add and subtract decimals to hundredths.



$$\begin{array}{r} {\scriptstyle 1\ 1} \\ 0.47 \\ +\ 3.75 \\ \hline 4.22 \end{array} \qquad \begin{array}{r} {\scriptstyle 3\ 15\ 12} \\ 4.62 \\ -\ 2.65 \\ \hline 1.97 \end{array}$$

We can multiply a decimal by a whole number.



$$\begin{array}{r} {\scriptstyle 1} \\ 2.4 \\ \times\ \ 3 \\ \hline 7.2 \end{array} \qquad \begin{array}{r} {\scriptstyle 1} \\ 0.45 \\ \times\ \ 3 \\ \hline 1.35 \end{array}$$

$$3\overline{)3.78} = 1.26 \qquad 4\overline{)5.00} = 1.25$$

3	4
7	10
6	8
18	20
18	20
0	0

We can divide a decimal by a whole number when there is no remainder.



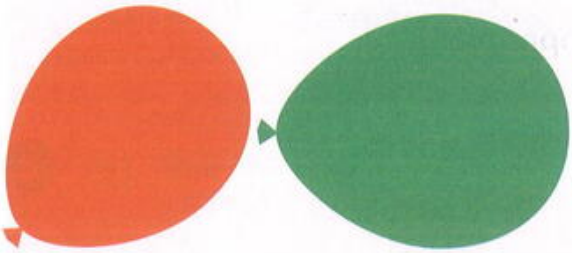
I wonder what kinds of new computations we will learn.



Lesson 1
Adding Decimals to Thousandths

1

Think



For a science experiment, Alex and Sofia weighed some inflated balloons. Alex's balloon weighed 5.064 g. Sofia's balloon weighed 3.756 g. How many grams did both balloons weigh altogether?

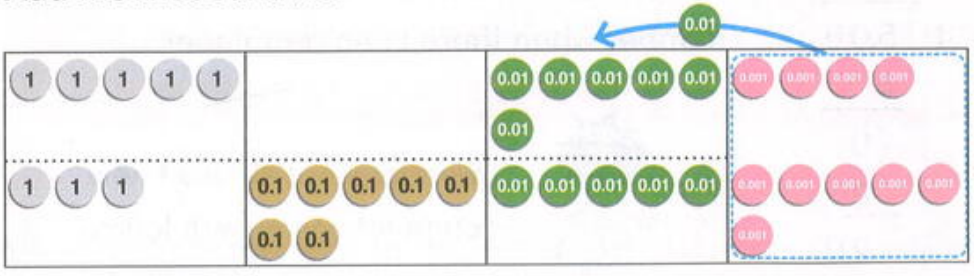


$5.064 + 3.756 \approx 5 + 4$

Together, the balloons weighed about 9 g.

Learn

Add the thousandths.



$$\begin{array}{r} {\scriptstyle 1} \\ 5.064 \\ +\,3.756 \\ \hline {\scriptstyle 0} \end{array}$$

4 thousandths + 6 thousandths
= 10 thousandths
= 1 hundredth

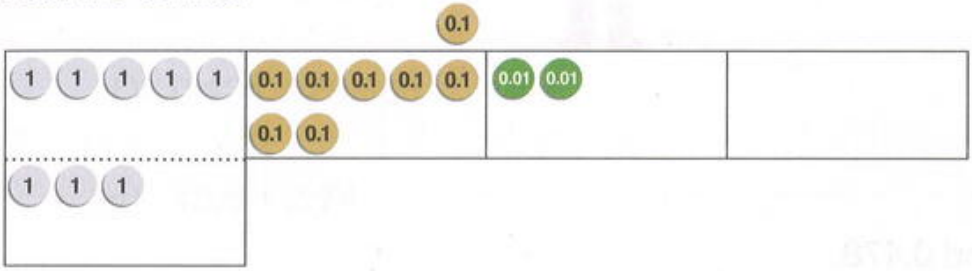
Add the hundredths.



$$\begin{array}{r} {\scriptstyle 1\,1} \\ 5.064 \\ +\,3.756 \\ \hline 20 \end{array}$$

1 hundredth + 6 hundredths + 5 hundredths
= 12 hundredths
= 1 tenth 2 hundredths

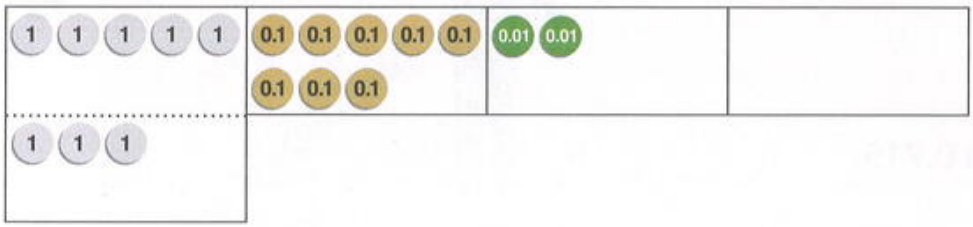
Add the tenths.



$$\begin{array}{r} {\scriptstyle 1\,1} \\ 5.064 \\ +\,3.756 \\ \hline .820 \end{array}$$

1 tenth + 7 tenths = 8 tenths

Add the ones.



$$\begin{array}{r} {\scriptstyle 1\,1} \\ 5.064 \\ +\,3.756 \\ \hline 8.820 \end{array}$$

5 ones + 3 ones = 8 ones

Together, the balloons weighed _____ g.

8.820 = 8.82, so we can write the answer as 8.82.





Don't forget to write the decimal point between the ones place and the tenths place in the answer.

Do

1 Add 0.825 and 0.157.

$$\begin{array}{r} 0.825 \\ +\ 0.157 \\ \hline \end{array}$$

Estimate first.
$0.825 + 0.157 \approx 0.8 + 0.2 = 1$



2 Add 0.675 and 0.135.

$$\begin{array}{r} 0.675 \\ +\ 0.135 \\ \hline \end{array}$$

3 Add 1.34 and 0.478.

$$\begin{array}{r} 1.340 \\ +\ 0.478 \\ \hline \end{array}$$

$1.34 = 1.340$



4 Add 4.6 and 0.715.

$$\begin{array}{r} 4.600 \\ +\ 0.715 \\ \hline \end{array}$$

5 Add.

(a) 2.58 + 4.36

(b) 8.53 + 6.47

(c) 13.96 + 6.04

(d) 2.384 + 0.647

(e) 0.082 + 0.538

(f) 0.134 + 29.866

(g) 12.6 + 2.74

(h) 0.738 + 21.2

6



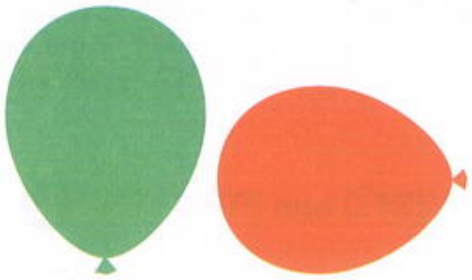
A quarter is 0.069 inches thick, a nickel is 0.077 inches thick, and a dime is 0.053 inches thick. A quarter, a nickel, and a dime are stacked on top of each other. What is the height of the stack of coins?

Exercise 1 • page 35

Lesson 2
Subtracting Decimals

2

Think



In the science experiment, Emma's balloon weighed 4.035 g. Dion's balloon weighed 3.146 g. How many more grams did Emma's balloon weigh than Dion's balloon?

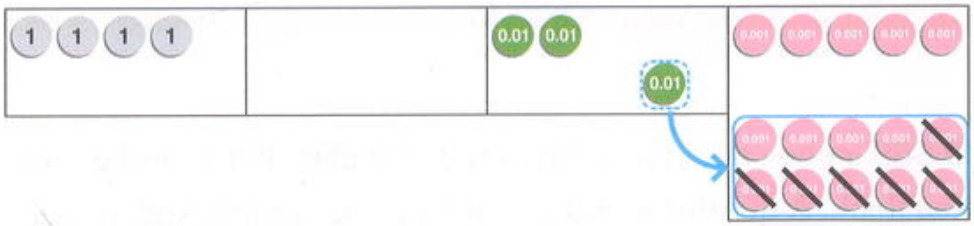


$4.035 - 3.146 \approx 4 - 3$

My balloon weighed about 1 g more than Dion's balloon.

Learn

Regroup from hundredths and subtract the thousandths.



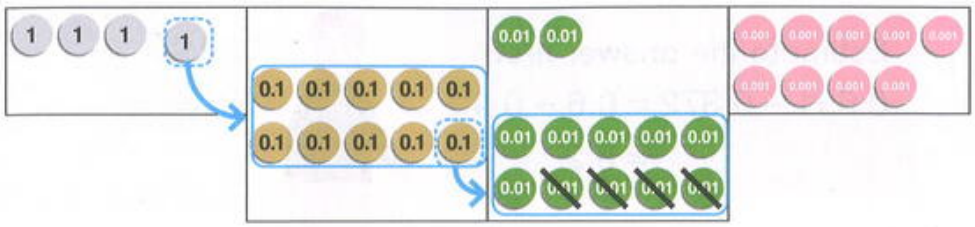
3 hundredths 5 thousandths = 2 hundredths 15 thousandths

15 thousandths − 6 thousandths = 9 thousandths

$$\begin{array}{r} {\scriptstyle 2\ 15} \\ 4.0\cancel{3}\cancel{5} \\ -\ 3.1\,4\,6 \\ \hline 9 \end{array}$$

There are no tenths to regroup from.

Regroup from ones and subtract the hundredths.

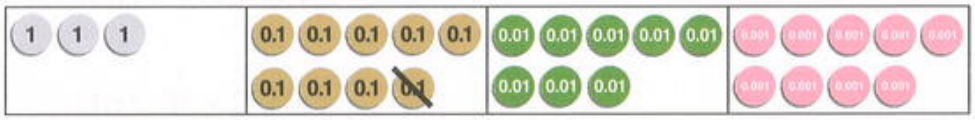


$$\begin{array}{r} {\scriptstyle 9} \\ 3\,{\scriptstyle 10}1215 \\ \not{4}.0\not{3}5 \\ -\,3.146 \\ \hline 89 \end{array}$$

4 ones 2 hundredths = 3 ones 9 tenths 12 hundredths

12 hundredths − 4 hundredths = 8 hundredths

Subtract the tenths.



$$\begin{array}{r} {\scriptstyle 9} \\ 3\,{\scriptstyle 10}1215 \\ \not{4}.0\not{3}5 \\ -\,3.146 \\ \hline .889 \end{array}$$

9 tenths − 1 tenth = 8 tenths

Subtract the ones.



$$\begin{array}{r} {\scriptstyle 9} \\ 3\,{\scriptstyle 10}1215 \\ \not{4}.0\not{3}5 \\ -\,3.146 \\ \hline 0.889 \end{array}$$

3 ones − 3 ones = 0 ones

Emma's balloon weighed _____ g more than Dion's balloon.

Check your answer.

$$\begin{array}{r} 4.035 \\ -\,3.146 \\ \hline \square \end{array} \qquad \begin{array}{r} \square \\ +\,3.146 \\ \hline 4.035 \end{array}$$



Do

1 Subtract 0.372 from 0.591.

$$\begin{array}{r} 0.591 \\ -\ 0.372 \\ \hline \end{array}$$

Estimate the answer first.
$0.591 - 0.372 \approx 0.6 - 0.4$
$= 0.2$



2 Subtract 0.384 from 0.534.

$$\begin{array}{r} 0.534 \\ -\ 0.384 \\ \hline \end{array}$$

3 Subtract 0.593 from 1.02.

$$\begin{array}{r} 1.020 \\ -\ 0.593 \\ \hline \end{array}$$



$1.02 = 1.020$

4 Subtract 0.075 from 1.3.

$$\begin{array}{r} 1.300 \\ -\ 0.075 \\ \hline \end{array}$$

$1.3 = 1.300$



5 Subtract 6.256 from 42.31.

$$\begin{array}{r} 42.310 \\ -\ 6.256 \\ \hline \end{array}$$

6 Subtract.

(a) 4.75 – 1.88

(b) 3.5 – 0.75

(c) 9 – 2.78

(d) 0.531 – 0.378

(e) 2.004 – 0.326

(f) 2.74 – 0.293

(g) 0.5 – 0.297

(h) 4 – 0.599

7 Celine wants to run a total of 10 miles in three days. She ran 2.6 miles on Monday and 3.75 miles on Tuesday. How far does she need to run on Wednesday?

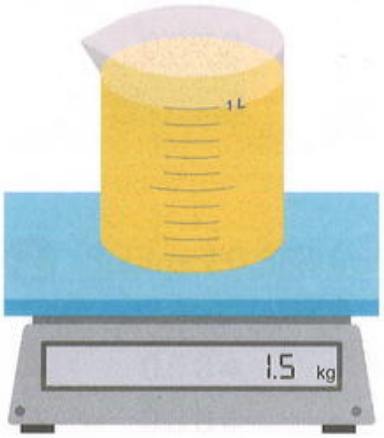


Exercise 2 • page 37

Lesson 3
Multiplying by 0.1 or 0.01

3

Think



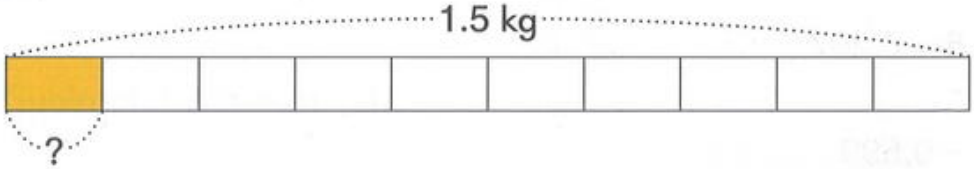
1 L of sand weighs 1.5 kg.

(a) How many kilograms does 0.1 L of sand weigh?

(b) How many kilograms does 0.01 L of sand weigh?

Learn

(a)



Method 1

$1.5 \times 0.1 = \frac{15}{10} \times \frac{1}{10}$

$= \frac{15}{100}$

$= 0.15$

1.5 = 15 tenths
15 tenths × 1 tenth =
(15 × 1) hundredths



Method 2

10 units ⟶ 1.5 kg

1 unit ⟶ 1.5 ÷ 10 = 0.15 kg

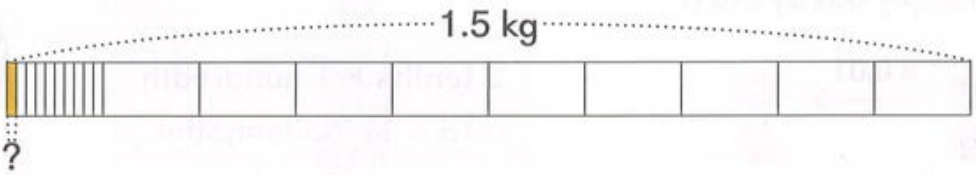
0.1 L of sand weighs _____ kg.

$1.5 \times 0.1 = 1.5 \div 10$

0.1 5



(b)



Method 1

$1.5 \times 0.01 = \frac{15}{10} \times \frac{1}{100}$

$= \frac{15}{1{,}000}$

$= 0.015$

1.5 = 15 tenths

15 tenths × 1 hundredth = (15 × 1) thousandths



Method 2

100 units ⟶ 1.5 kg

1 unit ⟶ 1.5 ÷ 100 = 0.015 kg

0.01 L of sand weighs _____ kg.

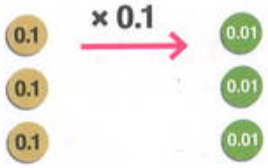
$1.5 \times 0.01 = 1.5 \div 100$

0.0 1 5



Do

1 (a) Multiply 0.3 by 0.1.



3 tenths × 1 tenth
= (3 × 1) hundredths



$0.3 \times 0.1 = \frac{\square}{10} \times \frac{\square}{10} = \frac{\square}{100} = 0.\square\square$

(b) Multiply 0.3 by 0.01.



3 tenths × 1 hundredth
= (3 × 1) thousandths



$0.3 \times 0.01 = \frac{\square}{10} \times \frac{\square}{100} = \frac{\square}{1{,}000} = 0.\square\square\square$

2 (a) Multiply 2.6 by 0.1.



0.2.6



$2.6 \times 0.1 = \square$

(b) Multiply 2.6 by 0.01.



0.0 2.6



$2.6 \times 0.01 = \square$

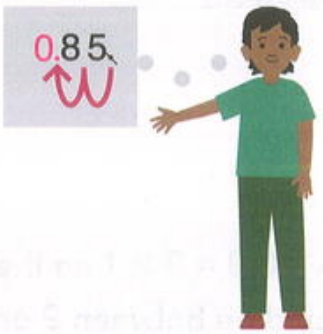
3 (a) Multiply 85 by 0.1.

$85 \times 0.1 =$ ☐



(b) Multiply 85 by 0.01.

$85 \times 0.01 =$ ☐



4 Multiply.

(a) 5×0.1

(b) 5×0.01

(c) 0.5×0.1

(d) 0.05×0.1

(e) 50×0.01

(f) 500×0.01

(g) 86×0.01

(h) 0.7×0.1

(i) 0.08×0.1

(j) 1.03×0.1

(k) 480.3×0.01

(l) $3{,}500 \times 0.01$

5 1 cup of rice weighs 0.18 kg. What is the weight of 0.1 cup of rice in kilograms?

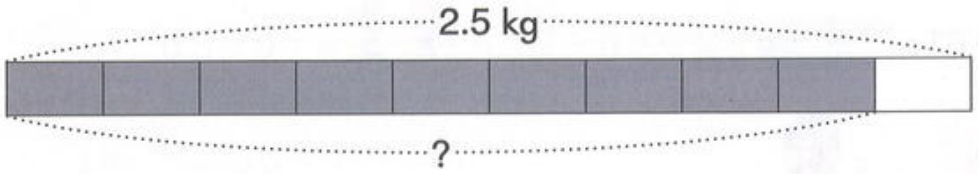
Exercise 3 • page 40

Lesson 4
Multiplying by a Decimal

4

Think

1 meter of pipe weighs 2.5 kg. How much does 0.9 meters of pipe weigh?



Learn

Method 1

$2.5 \times 0.9 = \frac{25}{10} \times \frac{9}{10}$

$= \frac{25 \times 9}{100}$

$= \frac{225}{100}$

$= 2.25$

$2.5 \times 0.9 \approx 3 \times 1$ so the answer should be between 2 and 3.

2.5 = 25 tenths
25 tenths × 9 tenths
= (25 × 9) hundredths



Method 2

$2.5 \times 0.9 = (25 \times 0.1) \times (9 \times 0.1)$

$= (25 \times 9) \times (0.1 \times 0.1)$

$= 225 \times 0.01$

$= 2.25$

$2.5 \times 0.9 = (25 \times 9) \times 0.01$



Method 3

25 × 9 is 100 times as much as 2.5 × 0.9.

$$\begin{array}{r} 2.5 \\ \times\ 0.9 \\ \hline 2.25 \end{array} \xrightarrow{\times 10,\ \times 10,\ \times 100} \begin{array}{r} 25 \\ \times\ 9 \\ \hline 225 \end{array}$$

÷ 100



$$\begin{array}{r} 2.5 \\ \times\ 0.9 \\ \hline 2.25 \end{array}$$

0.9 m of pipe weighs _____ kg.

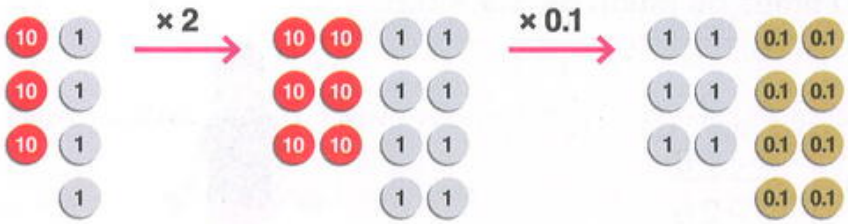
Multiply decimals the same way as whole numbers. Place a decimal point in the product according to the number of decimal places being multiplied.

$$\begin{array}{rl} 2.5 & \leftarrow 1 \text{ decimal place} \\ \times\ 0.9 & \leftarrow 1 \text{ decimal place} \\ \hline 2.25 & \leftarrow 2 \text{ decimal places} \end{array}$$



Do

1 (a) Multiply 34 by 0.2.





34 × 2 = 68
68 × 0.1 = ?

34 × 0.2 = ☐

(b) Multiply 34 by 0.02.

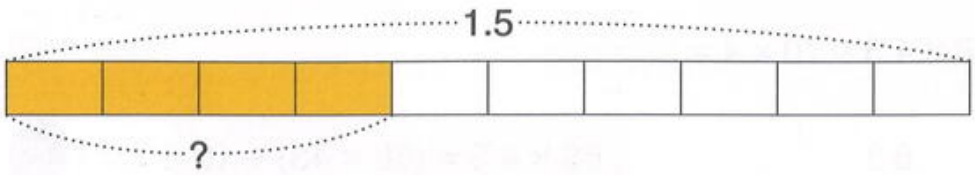




34 × 2 = 68
68 × 0.01 = ?

34 × 0.02 = ☐

2 (a) Multiply 1.5 by 0.4.



$1.5 \times 0.4 = \frac{\square}{10} \times \frac{\square}{10}$

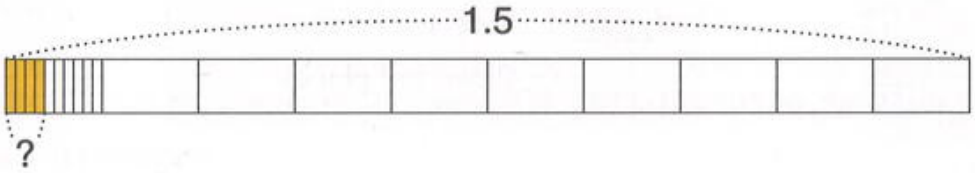
$= \frac{\square}{100}$

$= \square.\square$

1.5 = 15 tenths
15 tenths × 4 tenths
= (15 × 4) hundredths



(b) Multiply 1.5 by 0.04.



$1.5 \times 0.04 = \frac{\square}{10} \times \frac{\square}{100}$

$= \frac{\square}{1{,}000}$

$= \square.\square\square$

1.5 = 15 tenths
15 tenths × 4 hundredths
= (15 × 4) thousandths



3 Estimate the product of 68 and 4.3. Then find the actual product.

$68 \times 4.3 \approx 70 \times 4 =$ ☐

$$\begin{array}{r} 68 \\ \times\ 4.3 \\ \hline \square \\ \square \\ \hline \square \end{array}$$

$68 \times 4.3 = (68 \times 43) \div 10$

$$\begin{array}{r} 68 \\ \times\ 4.3 \leftarrow \text{1 decimal place} \\ \square \leftarrow \text{1 decimal place} \end{array}$$



4 Estimate the product of 13.5 and 2.4. Then find the actual product.

$13.5 \times 2.4 \approx 14 \times 2 =$ ☐

$$\begin{array}{r} 13.5 \\ \times\ 2.4 \\ \hline \square \\ \square \\ \hline \square \end{array}$$

$13.5 \times 2.4 = (135 \times 24) \div 100$

$$\begin{array}{r} 13.5 \leftarrow \text{1 decimal place} \\ \times\ 2.4 \leftarrow \text{1 decimal place} \\ \square \leftarrow \text{2 decimal places} \end{array}$$



5 Estimate the product of 38.7 and 0.45. Then find the actual product.

$38.7 \times 0.45 \approx 40 \times 0.5 =$ ☐

$$\begin{array}{r} 38.7 \\ \times\ 0.45 \\ \hline \square \\ \square \\ \hline \square \end{array}$$

$38.7 \times 0.45 = (387 \times 45) \div 1{,}000$

$$\begin{array}{r} 38.7 \leftarrow \text{1 decimal place} \\ \times\ 0.45 \leftarrow \text{2 decimal places} \\ \square \leftarrow \text{3 decimal places} \end{array}$$



6 Multiply.

(a) 40×0.7

(b) 0.4×0.7

(c) 0.14×0.8

(d) 0.06×0.3

(e) 8.2×7.9

(f) 0.65×2.8

(g) 40.75×9.6

(h) $0.4 \times 0.5 \times 0.2$

7 The product of 882×37 is 32,634. Without calculating, find the following products.

(a) 882×3.7

(b) 88.2×37

(c) 8.82×37

(d) 88.2×3.7

(e) 88.2×0.37

(f) 8.82×3.7

Exercise 4 • page 43

1 Add.

(a) 0.28 + 0.4

(b) 0.47 + 0.86

(c) 0.205 + 0.9

(d) 1.67 + 0.083

(e) 0.209 + 3.907

(f) 250.6 + 9.873

2 Subtract.

(a) 3.6 – 0.8

(b) 42.5 – 3.7

(c) 0.621 – 0.4

(d) 1.509 – 0.458

(e) 0.7 – 0.006

(f) 0.35 – 0.154

3 Multiply.

(a) 86 × 0.9

(b) 257 × 4.5

(c) 38 × 0.45

(d) 6.8 × 4.7

(e) 5.9 × 0.04

(f) 6.25 × 1.3

(g) 40.09 × 8.3

(h) 385.4 × 0.86

4 Without calculating, tell whether each product will be greater than, less than, or equal to 50.

(a) 50×0.8

(b) 1.2×50

(c) 0.98×50

(d) 50×1.06





5 A dog weighs 12.8 kg. A cat weighs 3.57 kg.

(a) How much do they weigh altogether?

(b) How much more does the dog weigh than the cat?

6 Jade had 4.5 m of ribbon. She used 1.2 m of the ribbon to make bows and 2.25 m of the ribbon to tie presents. How many meters of ribbon does she have left?

7 Jasmine has $8.40. Maria has 3.5 times as much money as Jasmine. How much money do they have altogether?

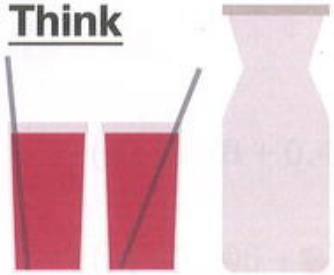
8 Josef ran 4.25 km. Laila ran 2.8 times as far as Josef. How much farther did Laila run than Josef?

Exercise 5 · page 46

Lesson 6
Dividing by a Whole Number — Part 1

6

Think



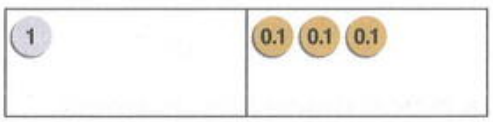
1.3 L of cranberry juice is poured equally into 2 cups. How much juice is in each cup?



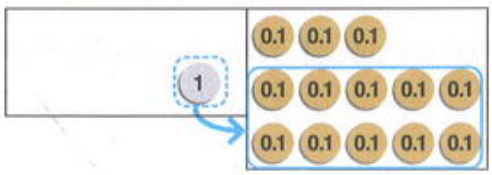
1.3 = 13 tenths
13 tenths ÷ 2 ≈ 12 tenths ÷ 2 = 6 tenths
The answer should be close to 0.6.

Learn

1.3 ÷ 2



Regroup 1 one 3 tenths as 13 tenths.



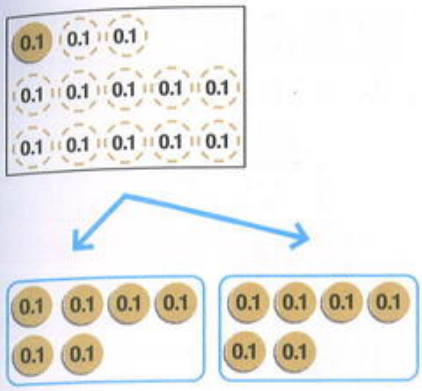
Write 0 in the ones place of the quotient and a decimal point between the ones and tenths place.



$$2\overline{)1.3}$$

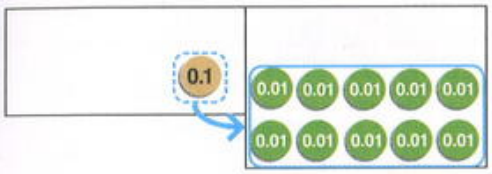
$$\begin{array}{r} 0. \\ 2\overline{)1.3} \end{array}$$

Divide the tenths by 2.



13 tenths ÷ 2 is 6 tenths with 1 tenth left over.

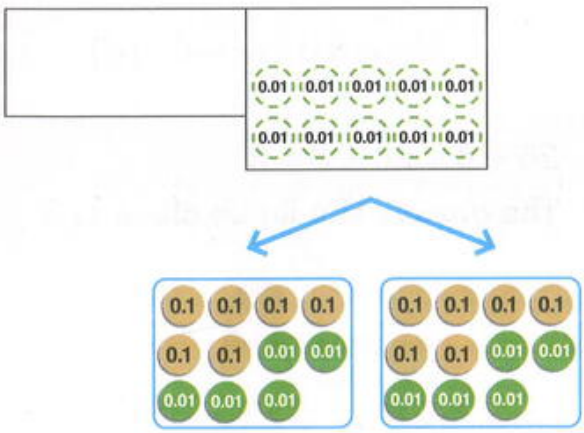
Regroup the remaining tenth as hundredths.



Write a 0 in the hundredths place of the number being divided and continue to divide. 1.3 = 1.30



Divide the hundredths by 2.



10 hundredths ÷ 2 is 5 hundredths.

There are _____ L of juice in each cup.

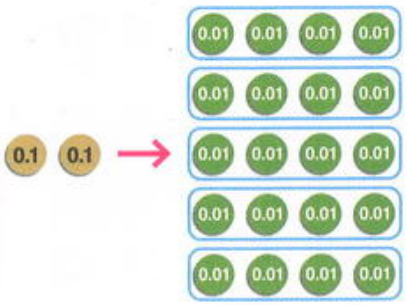
$$\begin{array}{r} 0.6 \\ 2\overline{)1.3} \\ \underline{12} \\ 1 \end{array}$$

$$\begin{array}{r} 0.6 \\ 2\overline{)1.30} \\ \underline{12} \\ 10 \end{array}$$

$$\begin{array}{r} 0.65 \\ 2\overline{)1.30} \\ \underline{12} \\ 10 \\ \underline{10} \\ 0 \end{array}$$

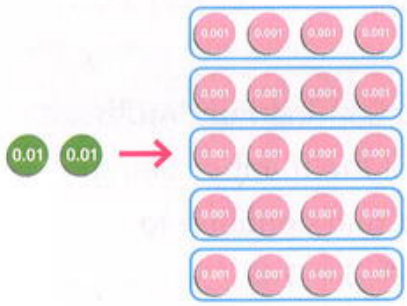
Do

1 (a) Divide 0.2 by 5.



$0.2 \div 5 = 0.\square\square$

(b) Divide 0.02 by 5.



$0.02 \div 5 = 0.\square\square\square$

2 (a) Divide 26 by 8.

$26 \div 8 \approx 24 \div 8 = 3$
The answer should be close to 3.



$$
\begin{array}{r}
\square\square.\square\square \\
8\overline{)\,2\;6.0\;0} \\
\square\square \\
\hline
2\;0 \\
\square\square \\
\hline
4\;0 \\
\square\square \\
\hline
\square
\end{array}
$$

26 ones ÷ 8

20 tenths ÷ 8

40 hundredths ÷ 8

(b) Divide 2.6 by 8.

$$8\overline{)2.600}$$

26 tenths ÷ 8

20 hundredths ÷ 8

40 thousandths ÷ 8

26 tenths ÷ 8
≈ 24 tenths ÷ 8
= 3 tenths
The answer should be close to 0.3.



3 (a) Divide 7,650 by 25.

$$25\overline{)7,650}$$

76 hundreds ÷ 25

150 ones ÷ 25

7,650 ÷ 25 ≈ 7,500 ÷ 25 = 300



(b) Divide 76.5 by 25.

$$25\overline{)76.5}$$

76 ones ÷ 25

150 hundredths ÷ 25

76.5 ÷ 25 ≈ 75 ÷ 25 = 3



4 Express $\frac{5}{8}$ as a decimal.

$$0.\square\square\square$$
$$8\overline{)5.000}$$

50 tenths ÷ 8

$$\begin{array}{r} 48 \\ \hline 20 \end{array}$$

20 hundredths ÷ 8

$$\begin{array}{r} \square\square \\ \hline 40 \end{array}$$

40 thousandths ÷ 8

$$\begin{array}{r} \square\square \\ \hline 0 \end{array}$$

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





I found the answer this way:

$$\frac{5}{8} \overset{\times 125}{=} \frac{?}{1{,}000} = ?$$

5 Estimate the values. Then find the actual values.

(a) 2,877 ÷ 42 (b) 287.7 ÷ 42 (c) 28.77 ÷ 42

6 Divide.

(a) 0.3 ÷ 4 (b) 24.71 ÷ 5 (c) 67.68 ÷ 12

7 6.2 L of water is poured equally into 8 containers. How many liters of water is in each container?

Exercise 6 • page 50

Lesson 7
Dividing by a Whole Number — Part 2

7

Think

Express $\frac{2}{3}$ as a decimal.

I cannot express $\frac{2}{3}$ as a fraction with a denominator of 10, 100, or 1,000. I will divide.



Learn

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

$$3\overline{)2.0} \rightarrow 0.6,\ 18,\ 2$$

$$3\overline{)2.00} \rightarrow 0.66,\ 18,\ 20,\ 18,\ 2$$

$$3\overline{)2.000} \rightarrow 0.666,\ 18,\ 20,\ 18,\ 20,\ 18,\ 2$$

Rather than continuing to divide the remainder, we can round the quotient to an approximate value. To round the quotient to the second decimal place, divide to the third decimal place and then round to the second decimal place: $0.666 \approx 0.67$.



$\frac{2}{3}$ is 0.67, correct to the second decimal place.



What would happen if we continue to divide? 0.6666...

Do

1 Express $4\frac{3}{7}$ as a decimal correct to the second decimal place.

$$7\overline{)3.000}$$

28

2

$4\frac{3}{7} \approx$ ▭

$4\frac{3}{7} = 4 + \frac{3}{7}$

$\frac{3}{7} = 3 \div 7 = ?$

$4\frac{3}{7} = 4 + ?$



2 Divide 4.65 by 8. Express the quotient correct to the second decimal place.

$$8\overline{)4.65}$$

40

6

$4.65 \div 8 \approx$ ▭

$4.65 \div 8 \approx 4 \div 8 = 0.5$

The answer should be close to 0.5.



3 Divide 4.29 by 16. Express the quotient correct to the second decimal place.

$$\begin{array}{r} \square.\square\square\square \\ 16\overline{)\,4.2\;9\;\square} \\ \underline{3\;2} \\ 1\;0\;\square \\ \quad\;\square\;\square \\ \quad\overline{\square\;\square\;\square} \\ \quad\;\square\;\square\;\square \\ \quad\overline{\qquad\square} \end{array}$$

$4.29 \div 16 \approx 4 \div 20 = 0.2$
The answer should be close to 0.2.



$4.29 \div 16 \approx$ ☐

4 Express each fraction or mixed number as a decimal correct to the second decimal place.

(a) $\frac{1}{7}$ (b) $\frac{4}{9}$ (c) $1\frac{5}{6}$

5 Divide. Express the quotients correct to the second decimal place.

(a) $19 \div 6$ (b) $2.3 \div 7$ (c) $67.68 \div 12$

(d) $5.4 \div 11$ (e) $80.9 \div 38$ (f) $104.8 \div 42$

6 30.5 lb of coffee are put equally into 12 bags. About how many pounds of coffee are in each bag? Express the answer correct to 2 decimal places.

Exercise 7 • page 54

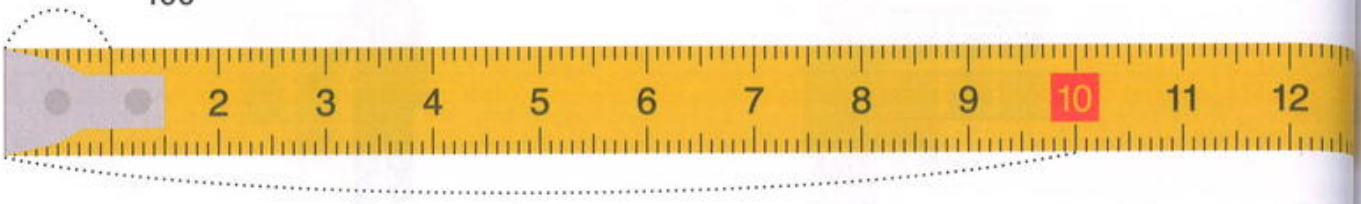
Lesson 8
Dividing a Whole Number by 0.1 and 0.01

8

Think

This tape measure shows every 10 centimeters marked with red numbers.
10 centimeters = 1 decimeter

$1 \text{ cm} = \frac{1}{100} \text{ m} = 0.01 \text{ m}$



$1 \text{ dm} = \frac{1}{10} \text{ m} = 0.1 \text{ m}$

(a) How many decimeters are in 3 m? What is $3 \div 0.1$?

(b) How many centimeters are in 3 m? What is $3 \div 0.01$?

Learn

(a) $3 \div 0.1 = 3 \div \frac{1}{10}$

$= 3 \times 10$

$= 30$

Dividing by 0.1 is the same as multiplying by the reciprocal of $\frac{1}{10}$ which is 10.



There are _____ decimeters in 3 m.

(b) $3 \div 0.01 = 3 \div \frac{1}{100}$

$= 3 \times 100$

$= 300$

Dividing by 0.01 is the same as multiplying by the reciprocal of $\frac{1}{100}$ which is 100.

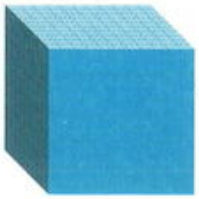


There are _____ centimeters in 3 m.

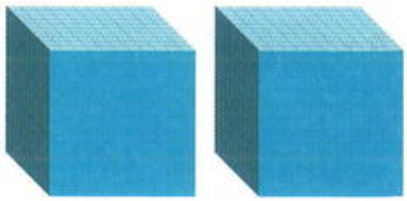
Do

1

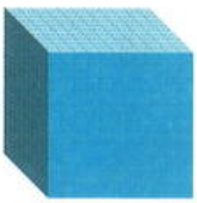


(a) How many  are in  ?

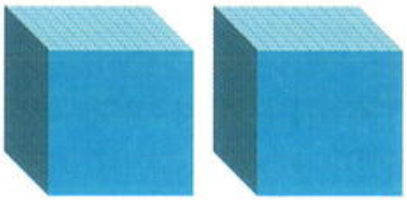
$1 \div 0.1 =$ ☐

(b) How many  are in  ?

$2 \div 0.1 =$ ☐

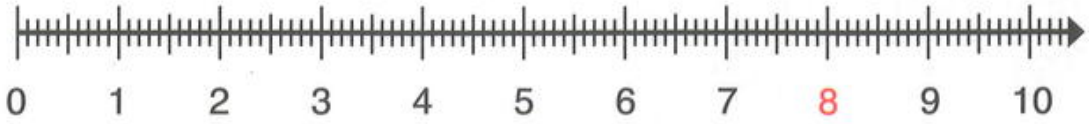
(c) How many  are in  ?

$1 \div 0.01 =$ ☐

(d) How many  are in  ?

$2 \div 0.01 =$ ☐

2 Divide 8 by 0.1.



$8 \div 0.1 = 8 \times$ ☐

$=$ ☐

$8 \div \frac{1}{10} = 8 \times ?$



3 Divide 8 by 0.01.

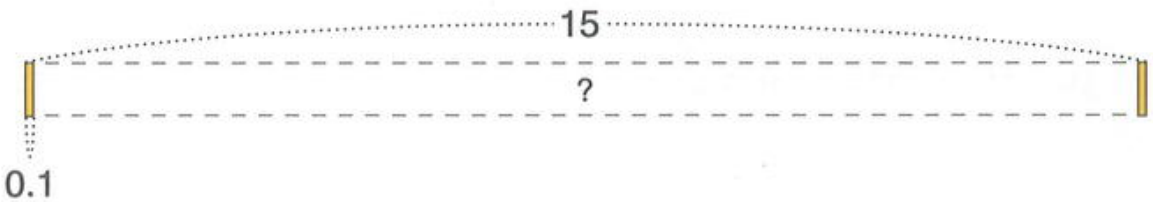
$8 \div 0.01 = 8 \times$ ☐

$=$ ☐

$8 \div \frac{1}{100} = 8 \times ?$



4 Divide 15 by 0.1.



$15 \div 0.1 = 15 \times$ ☐

$=$ ☐

$15 \div \frac{1}{10} = 15 \times ?$

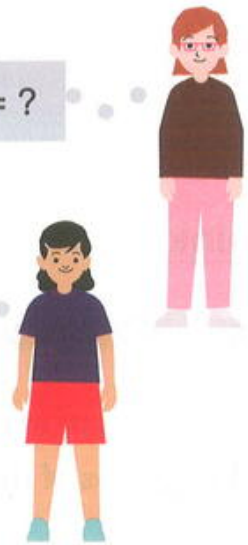


5 (a) Divide 48 by 0.1.

$48 \div 0.1 =$ ☐

(b) Divide 48 by 0.01.

$48 \div 0.01 =$ ☐



6 (a) $6 \div 0.1$

(b) $10 \div 0.1$

(c) $40 \div 0.1$

(d) $75 \div 0.1$

(e) $100 \div 0.1$

(f) $7 \div 0.01$

(g) $10 \div 0.01$

(h) $95 \div 0.01$

(i) $100 \div 0.01$

(j) $485 \div 0.01$

(k) $4 \times 0.1 \div 0.1$

(l) $5 \div 0.01 \times 0.1$

7



A deciliter (dL) is 0.1 L. How many deciliters are in 9 liters?

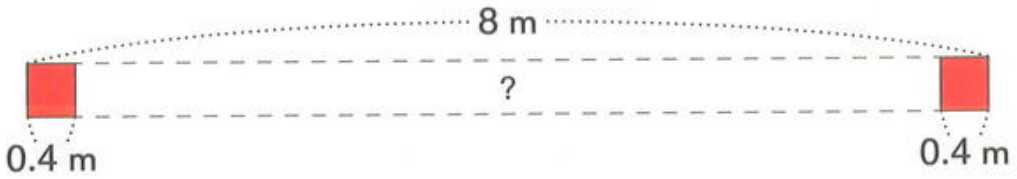
Exercise 8 • page 57

Lesson 9
Dividing a Whole Number by a Decimal

9

Think

Harry has 8 m of rope. He wants to cut the rope into 0.4 m long pieces. How many 0.4 m pieces of rope will he have?





Will the quotient be greater than or less than 8? Why?

Learn

Method 1

$$8 \div 0.4 = 8 \div \frac{4}{10}$$

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

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

$$= 20$$

Method 2

$8 \div 0.4$

$\times 10 \downarrow \quad \downarrow \times 10$

$80 \div 4$



If we multiply both the dividend and the divisor by 10 we can divide with whole numbers. The quotient will be the same.

$$0.4\overline{)8.0} \rightarrow 4\overline{)80} \quad \begin{array}{r} 20 \\ \hline 80 \\ \underline{80} \\ 0 \end{array}$$



$8 \div 0.4 = 80 \div 4$

$= 20$

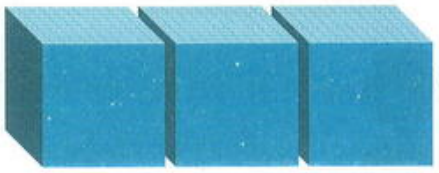
Moving the decimal point the same number of places to the right in both numbers gives the same result as multiplying them both by the same number. The quotient will not change.



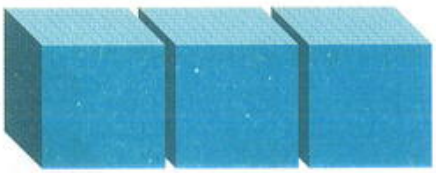
He will have _____ pieces of rope.

Do

1  = 1 = 0.1 = 0.01

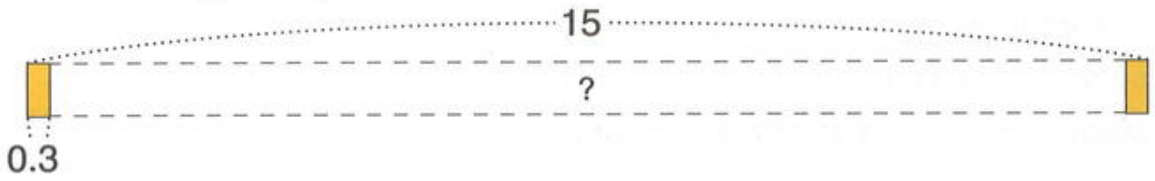
(a) How many groups of  are in  ?

$3 \div 0.2 =$ ☐

(b) How many groups of  are in  ?

$3 \div 0.02 =$ ☐

2 Divide 15 by 0.3.



$15 \div 0.3 = 15 \times \frac{\square}{\square}$

$= \square$

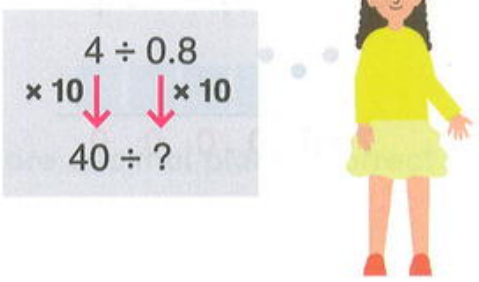
$15 \div \frac{3}{10} = 15 \times ?$



3 (a) Divide 4 by 0.8.

$4 \div 0.8 = 40 \div$ ☐

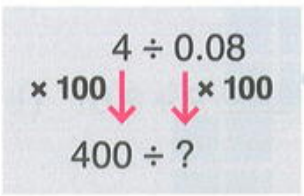
$=$ ☐



(b) Divide 4 by 0.08.

$4 \div 0.08 = 400 \div$ ☐

$=$ ☐

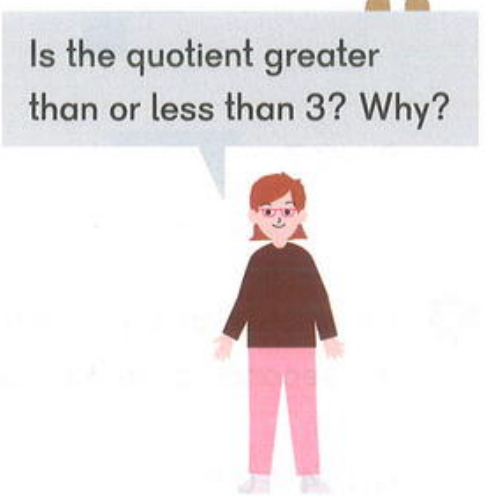




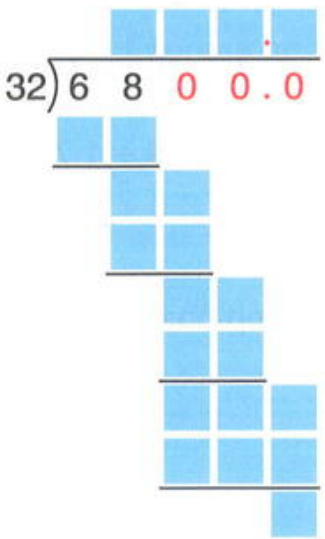
4 Divide 3 by 1.5.

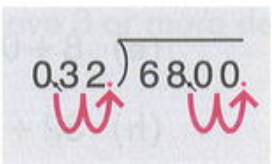
$3 \div 1.5 = 30 \div$ ☐

$=$ ☐



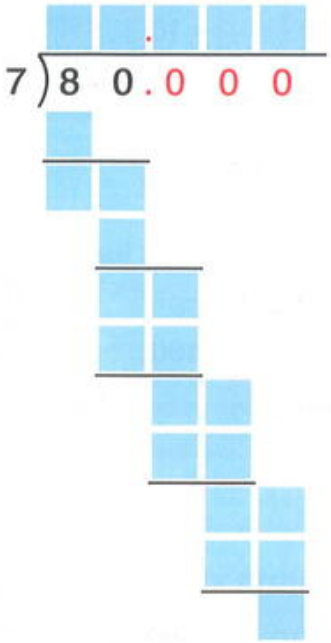
5 Divide 68 by 0.32.

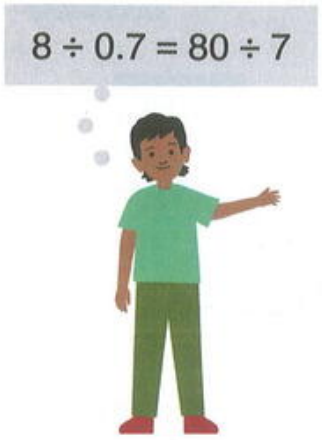






6 Divide 8 by 0.7. Express the quotient correct to the second decimal place.





$8 \div 0.7 \approx$ ____

7 Divide. Express quotients that have 3 or more decimal places correct to the second decimal place.

(a) $4 \div 0.5$ (b) $20 \div 0.4$ (c) $819 \div 0.9$

(d) $1{,}988 \div 0.7$ (e) $8 \div 0.25$ (f) $498 \div 8.3$

(g) $100 \div 0.3$ (h) $32 \div 0.3$ (i) $29 \div 1.7$

8 If 0.8 lb of shrimp cost $17, what does 1 lb of shrimp cost?

Exercise 9 • page 59



1 Divide. Express quotients that have 3 or more decimal places correct to the second decimal place.

(a) $6 \div 5$

(b) $9 \div 4$

(c) $7 \div 8$

(d) $10.8 \div 9$

(e) $7.2 \div 8$

(f) $3.848 \div 4$

(g) $22 \div 7$

(h) $1.03 \div 9$

2 Divide.

(a) $9 \div 0.1$

(b) $6 \div 0.01$

(c) $72 \div 0.1$

(d) $204 \div 0.01$

3 Divide. Express quotients that have 3 or more decimal places correct to the second decimal place.

(a) $6 \div 0.3$

(b) $42 \div 0.7$

(c) $5 \div 0.08$

(d) $102 \div 1.6$

(e) $80 \div 2.3$

(f) $209 \div 0.35$

4 10 m of cloth is cut into 4 equal length pieces. How long is each piece?

5 11.2 L of water is poured into 7 containers equally. How many liters of water are in each container?

6 

Michelle has 48 L of apple cider. She wants to fill bottles with 0.8 L of cider. How many bottles will she need?

7 A centiliter (cL) is 0.01 liters. How many centiliters are in 5 liters?

8 It takes a road crew 4 hours to pave 0.8 miles of roadway. How many hours will it take to pave 1 mile of roadway?

9 Jessica has 12 lb of rice. She wants to fill bags so that each contain 0.25 lb of rice. How many bags can she fill?

10 (a) Write a word problem for $0.5 \div 2$.

(b) Write a word problem for $2 \div 0.5$.

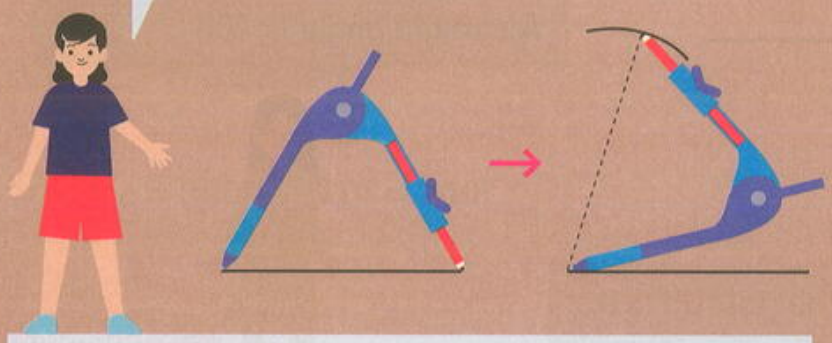
Exercise 10 • page 62

Chapter 11

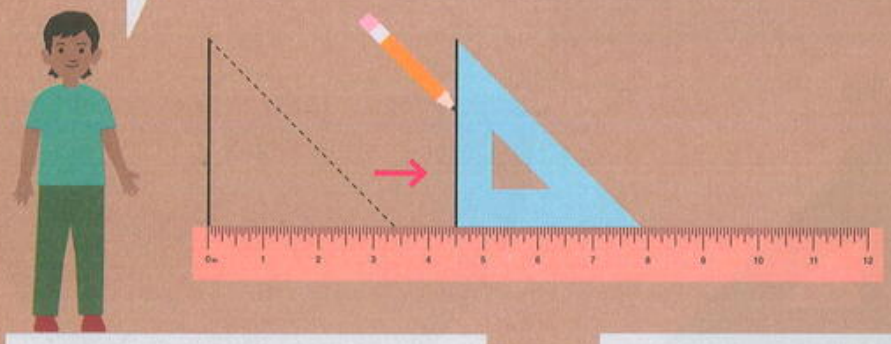
Geometry

How do we use these geometry tools?

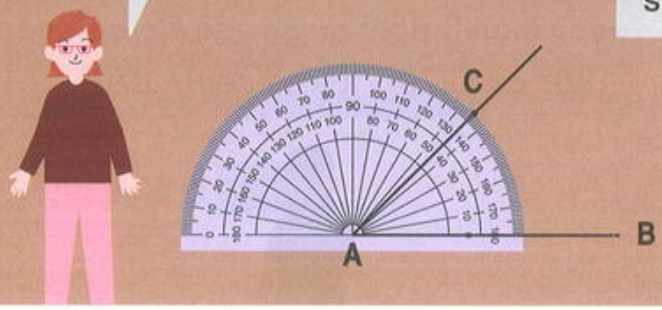
We can use a compass to compare lengths, and also to draw arcs and circles.



We can use a set square to draw parallel lines.



We can use a protractor to measure and draw angles.



What kind of angle is ∠BAC? Which scale on the protractor should I use to measure it?



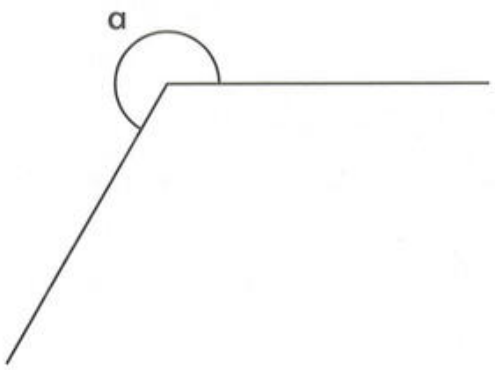
Lesson 1
Measuring Angles

1

Think

(a) Estimate the size of the reflex angle a.

(b) Measure ∠a.

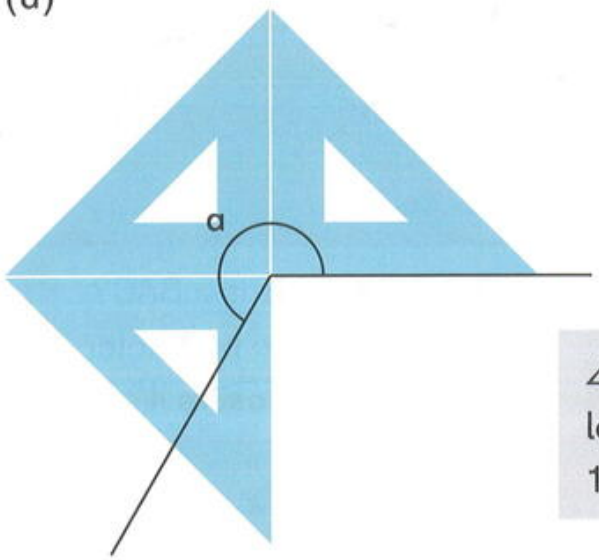


A reflex angle is an angle that is greater than a straight angle. A straight angle is 180°.



Learn

(a)



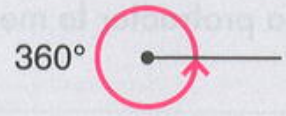
∠a is greater than 2 right angles and less than 3 right angles so it's between 180° and 270°. It's closer to 270°.



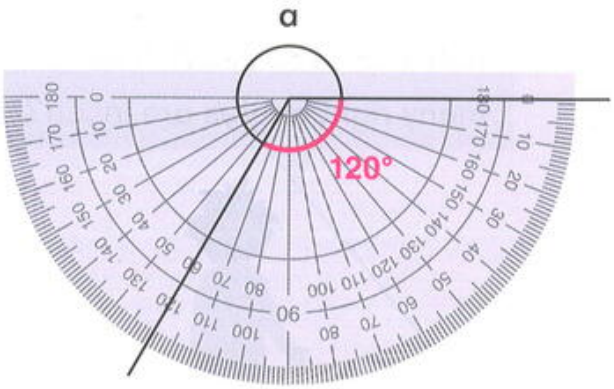
Angle a is about ____°.

(b) Measure ∠a.

∠a is 120° less than a full circle.



Method 1



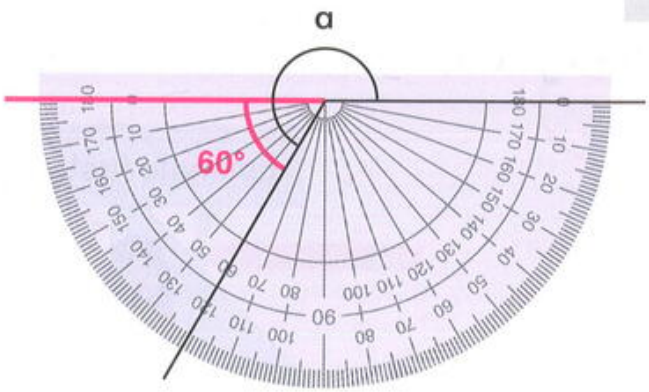


$\angle a = 360° - 120° = 240°$

∠a is 60° larger than a straight angle.



Method 2



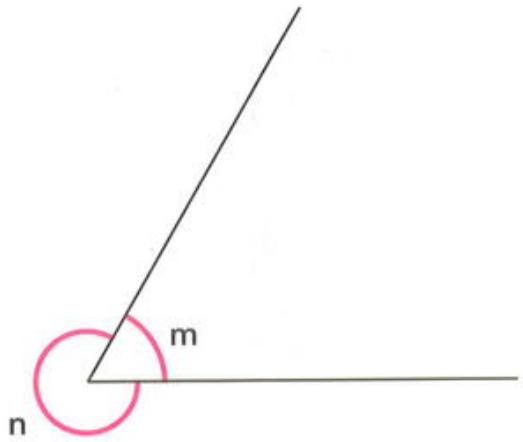


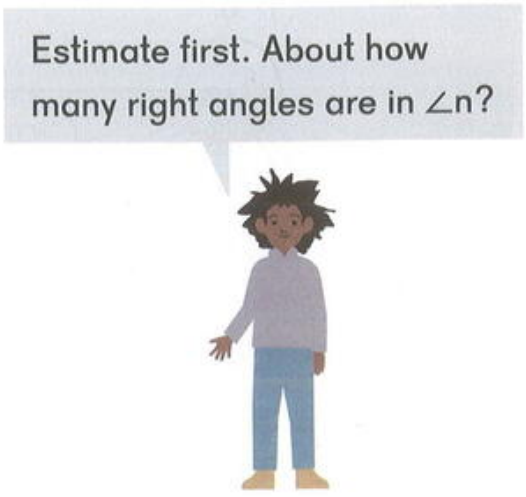
$\angle a = 180° + 60° = 240°$

Angle a is ____°.

Do

1 Use a protractor to measure ∠m. Then calculate the measure of ∠n.

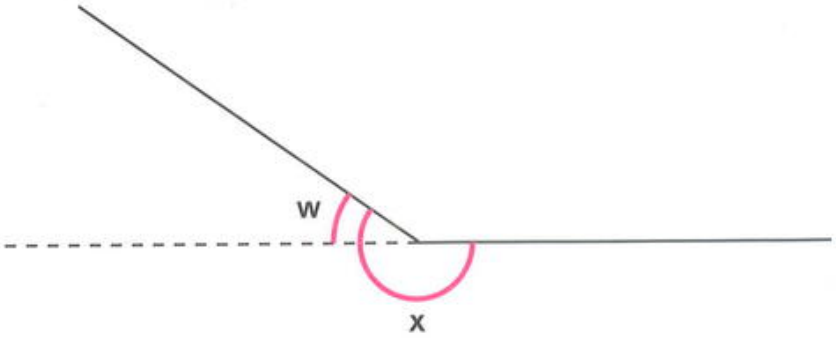




∠m = ☐°

∠n = 360° − ☐° = ☐°

2 Use a protractor to measure ∠w. Then give the measure of ∠x.

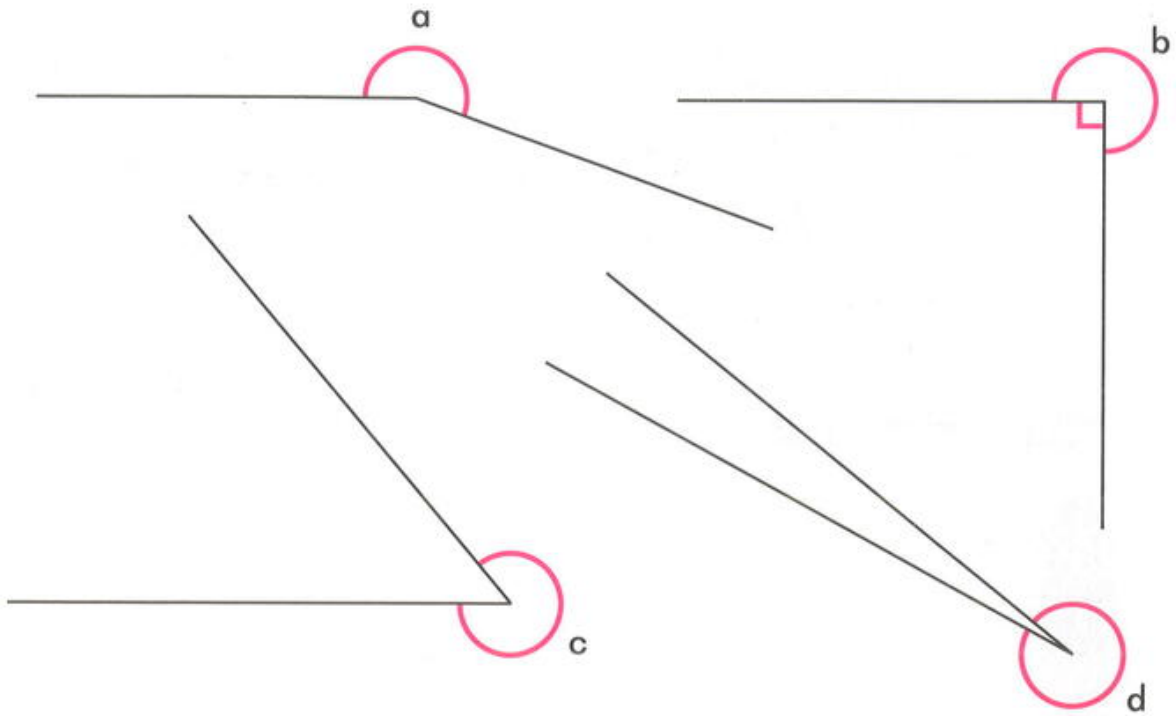




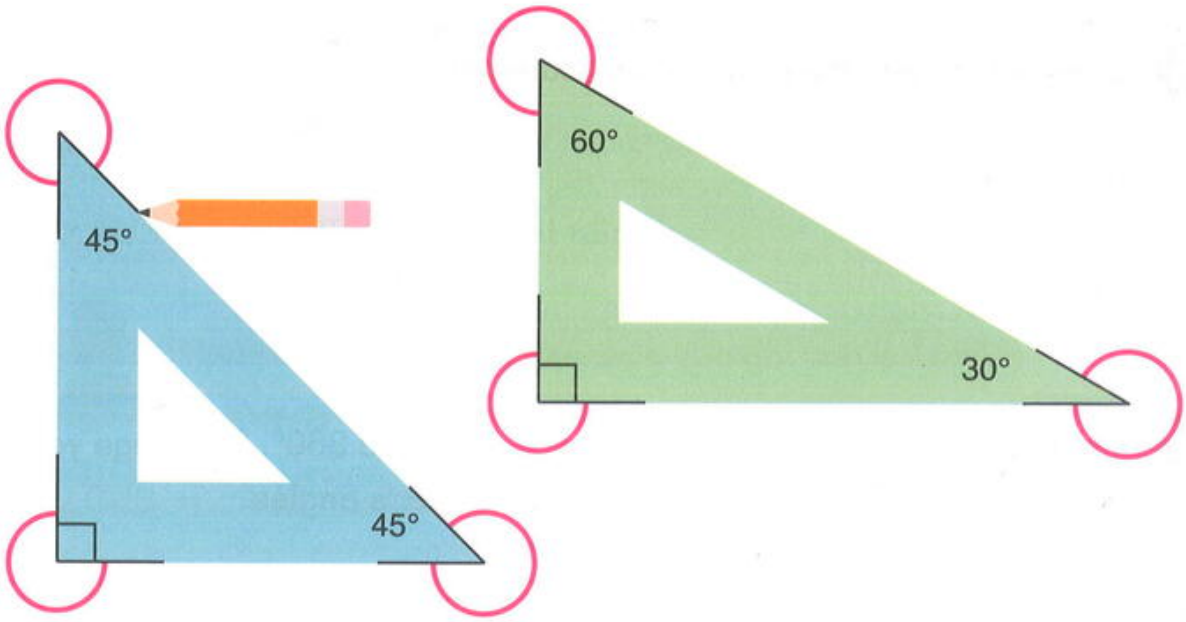
∠w = ☐°

∠x = 180° + ☐° = ☐°

3 Estimate and then find the measure of each marked angle.

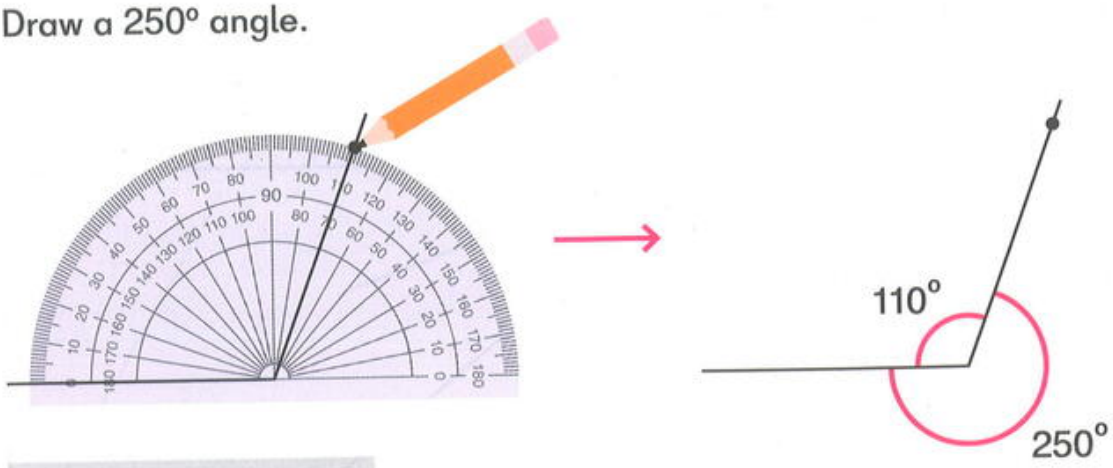


4 Use the corners of the set squares to draw angles and mark the reflex angles with an arc.



What are the measures of the reflex angles you drew?

5 Draw a 250° angle.



$360° - 250° = 110°$



6 Draw angles with the following measurements.

(a) 190°

(b) 295°

7 Draw an angle that measures between 180° and 360°. Exchange your drawing with a friend and measure each other's angles.

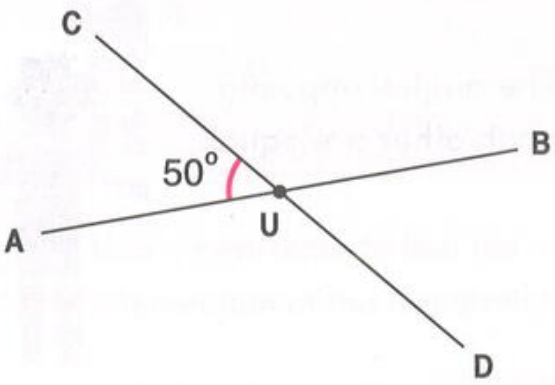
Exercise 1 • page 65

Lesson 2
Angles and Lines

2

Think

AB and CD are straight lines that intersect at Point U. $\angle AUC = 50°$.





(a) What are the measures of $\angle CUB$, $\angle BUD$, and $\angle AUD$?

(b) What do you notice about the angles that are opposite each other?

(c) What is the sum of all four angles at the point of intersection?

Learn

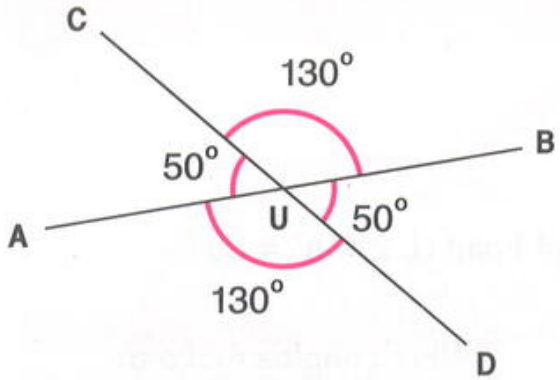
(a) $\angle AUB$ and $\angle CUD$ are straight angles.



$\angle CUB = \angle AUB - \angle AUC = 180° - 50° = 130°$

$\angle BUD = \angle CUD - \angle CUB = 180° - 130° = 50°$

$\angle AUD = \angle AUB - \angle BUD = 180° - 50° = 130°$



(b) $\angle CUB = \angle AUD$

$\angle AUC = \angle BUD$

The angles opposite each other are equal.

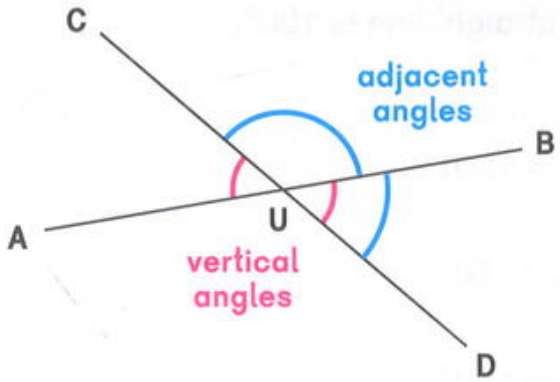


(c) $130° + 50° + 130° + 50° = 360°$



The sum of all the angles around a point forms a complete rotation, which is a 360° angle.

Angles next to each other are called **adjacent angles**. When two straight lines intersect, the adjacent angles form a straight angle. Angles opposite each other are called **vertical angles**. Vertical angles are equal.



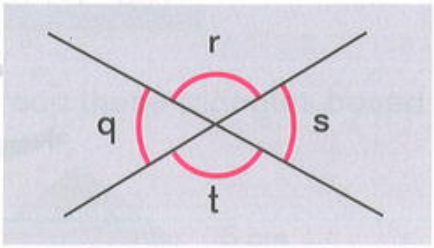
Which other angles are vertical angles? Which other angles are adjacent angles?



Do

1 Draw two lines that intersect. Label the angles q, r, s, and t.





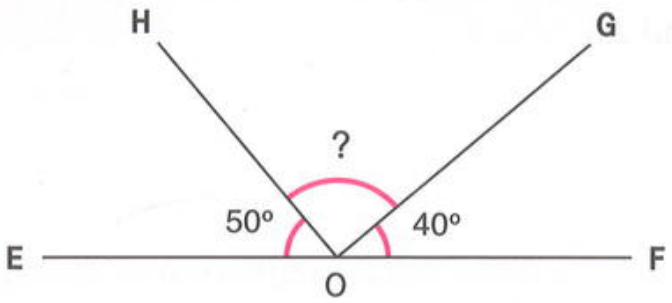
Use a protractor to find the measures of each angle formed by the intersection of the two straight lines.

(a) Which angles are the same size?

(b) Which angles form straight angles?

(c) Which angles together have a sum of 360°?

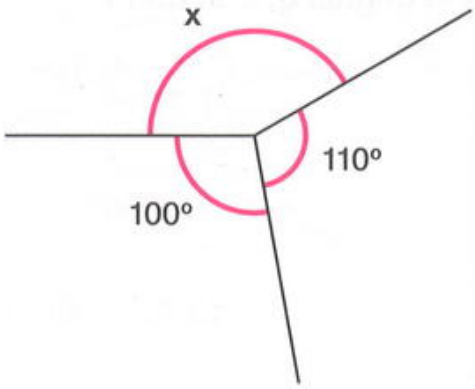
2 EF is a straight line. What is the measure of ∠HOG?





$50° + 40° + ? = 180°$

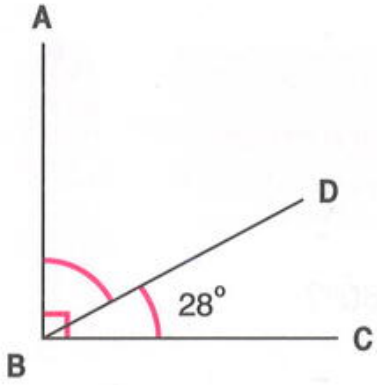
3 What is the measure of $\angle x$?



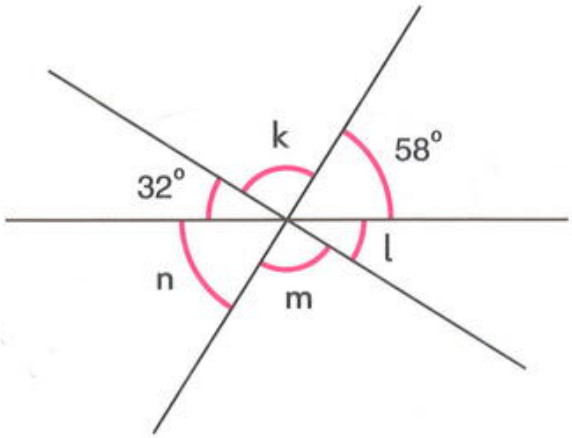
$100° + 110° + ? = 360°$



4 What is the measure of $\angle ABD$?



5 The three straight lines shown below intersect at one point. Find the measures of $\angle k$, $\angle l$, $\angle m$, and $\angle n$.



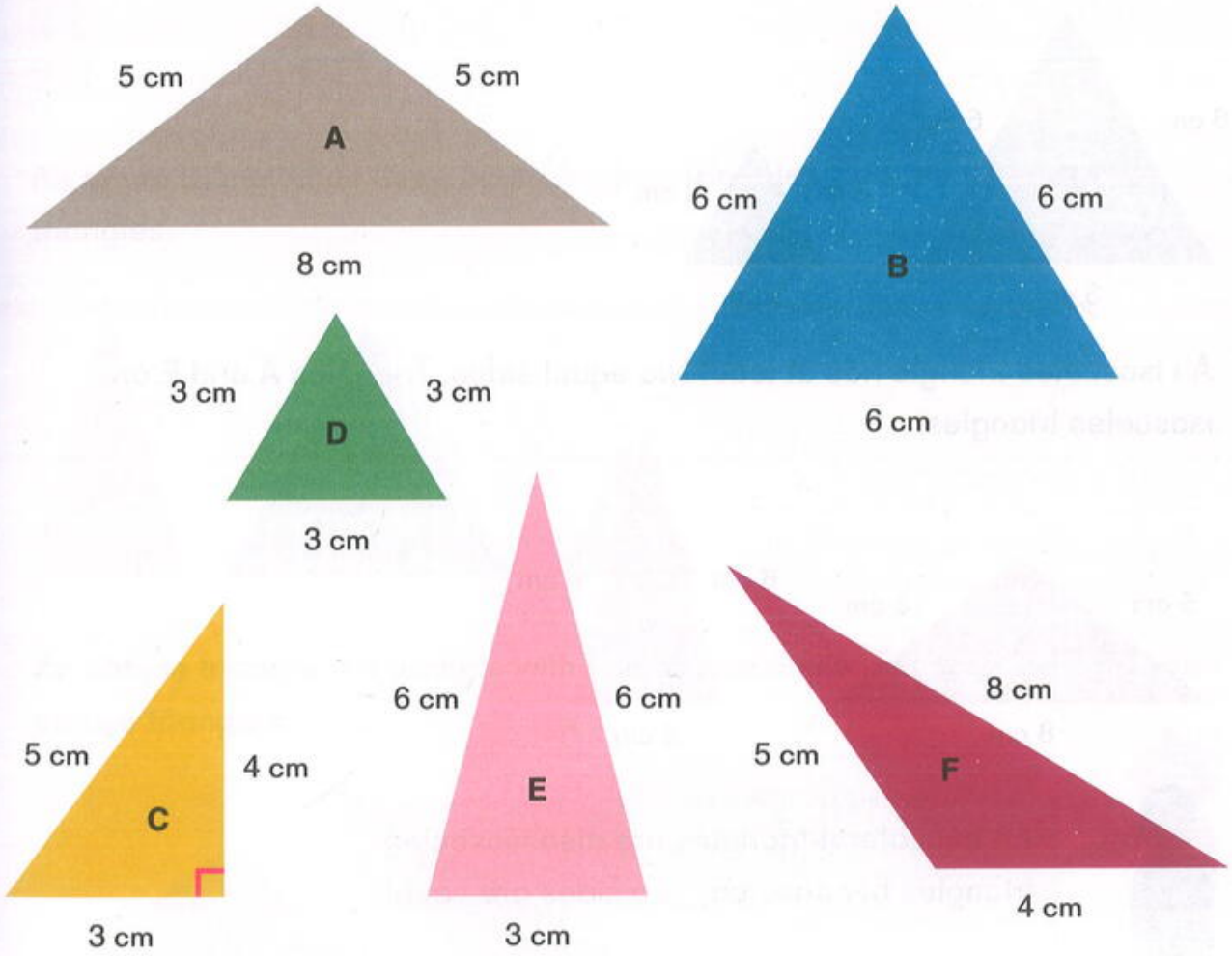
Exercise 2 • page 69

Lesson 3
Classifying Triangles

3

Think

How can we group these triangles based on their similarities?



If I look at the lengths of the sides...

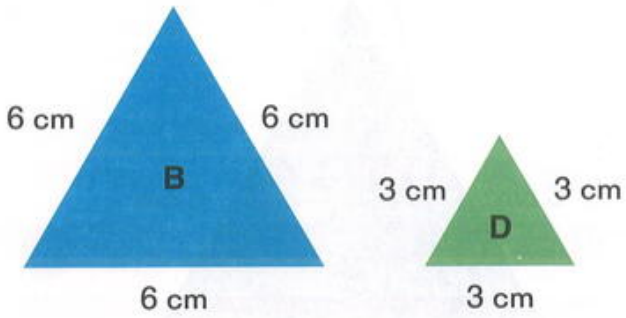


I can use a set square to see if the angles are greater than, less than, or equal to a right angle, and then...

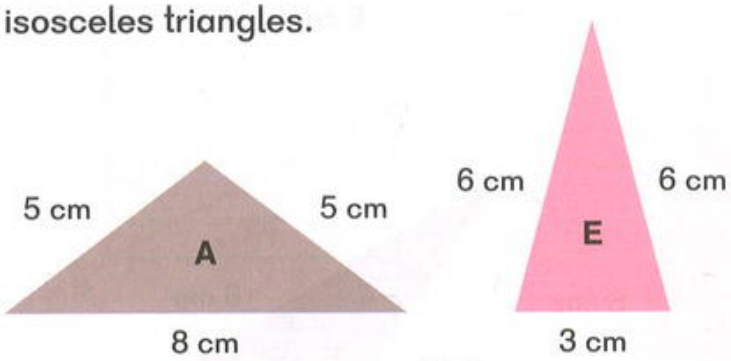
Learn

We can classify triangles according to the lengths of their sides.

An equilateral triangle has 3 equal sides. Triangles B and D are equilateral triangles.



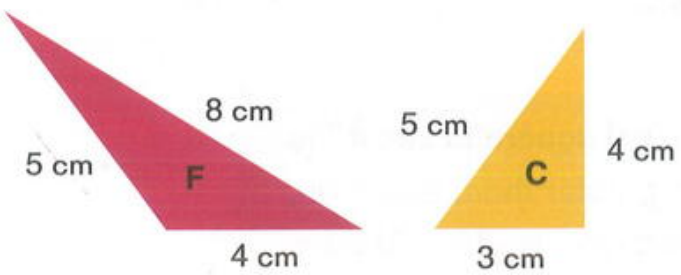
An isosceles triangle has at least two equal sides. Triangles A and E are isosceles triangles.





All equilateral triangles are also isosceles triangles because any two sides are equal.

A **scalene** triangle has no equal sides. Triangles F and C are scalene triangles.

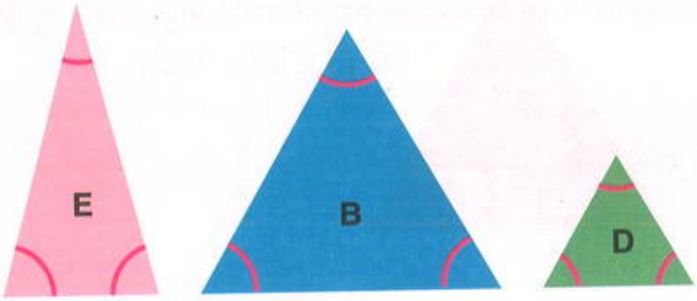


We can classify triangles according to the size of their angles.



A right angle is equal to 90°. An acute angle is an angle that is less than 90°. An obtuse angle is an angle that is greater than 90° and less than 180°.

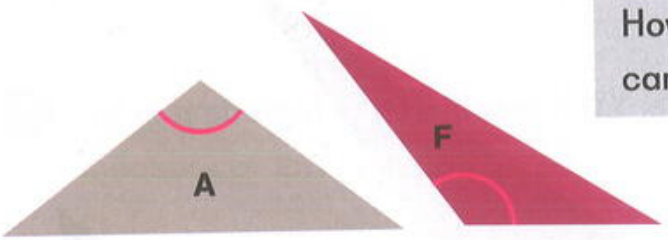
An **acute** triangle has three acute angles. Triangles E, B, and D are acute triangles.



An **obtuse** triangle is a triangle with one obtuse angle. Triangles A and F are obtuse triangles.

How many obtuse angles can a triangle have?





A right triangle has one right angle. Triangle C is a right triangle.

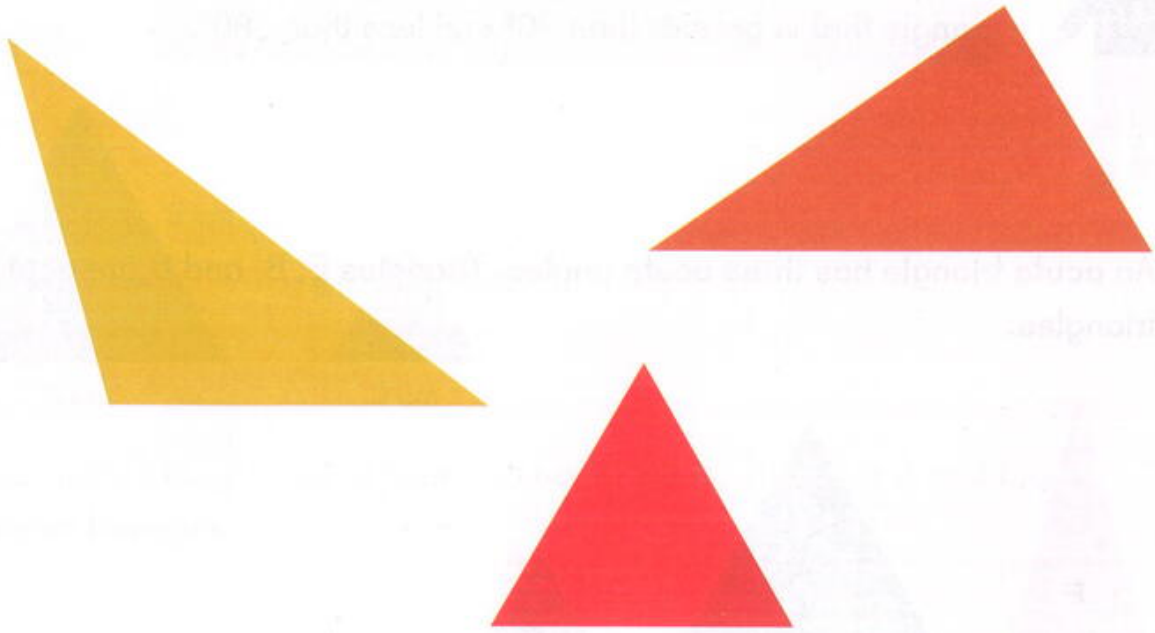
How many right angles can a triangle have?



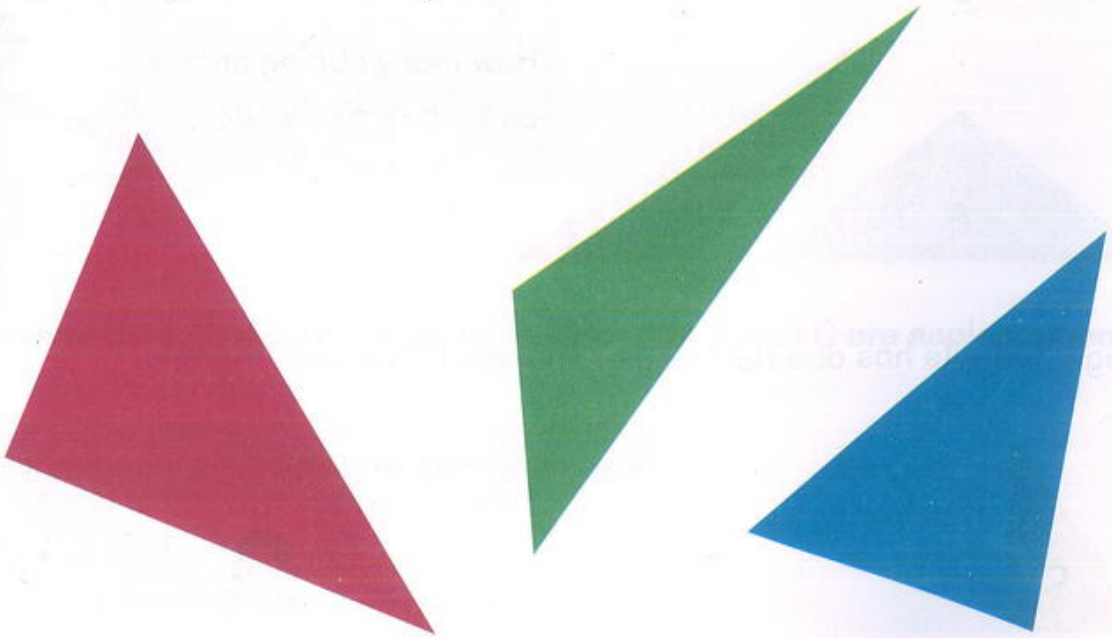


Do

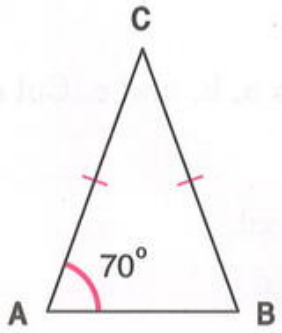
1. Use a compass or ruler to compare the lengths of the sides of each triangle. Tell whether each triangle is an equilateral triangle, an isosceles triangle or a scalene triangle.



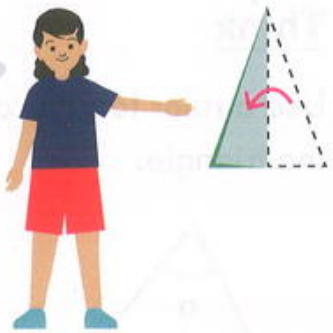
2. Tell whether each triangle is an acute triangle, an obtuse triangle, or a right triangle. Use a set square.



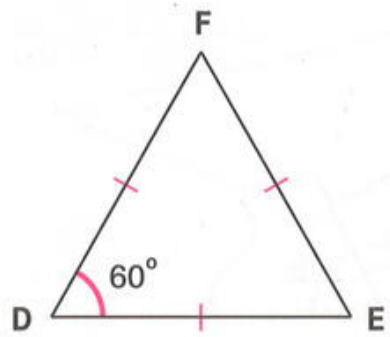
3 Triangle ACB is an isosceles triangle. $\angle CAB = 70°$. What is the measure of $\angle ABC$?



The angles opposite the equal sides are equal.



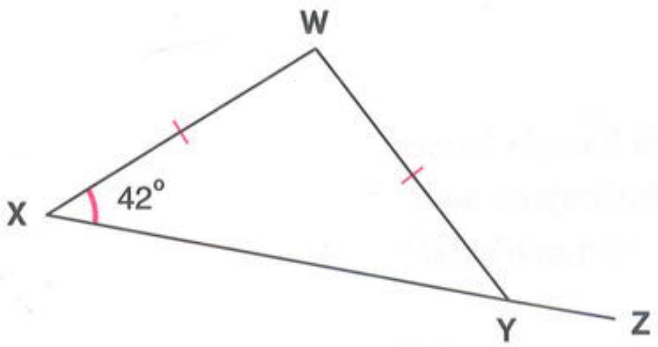
4 Triangle DEF is an equilateral triangle. $\angle FDE = 60°$. What is the measure of $\angle DEF$ and $\angle EFD$?



Sides FD and FE are equal.
So are sides FD and DE.



5 XZ is a straight line. Triangle XWY is an isosceles triangle. What is the measure of $\angle WYZ$?



Which angles are equal?



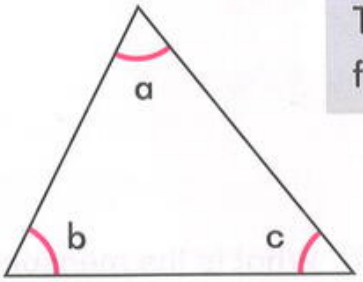
Exercise 3 • page 73

Lesson 4
The Sum of the Angles in a Triangle

4

Think

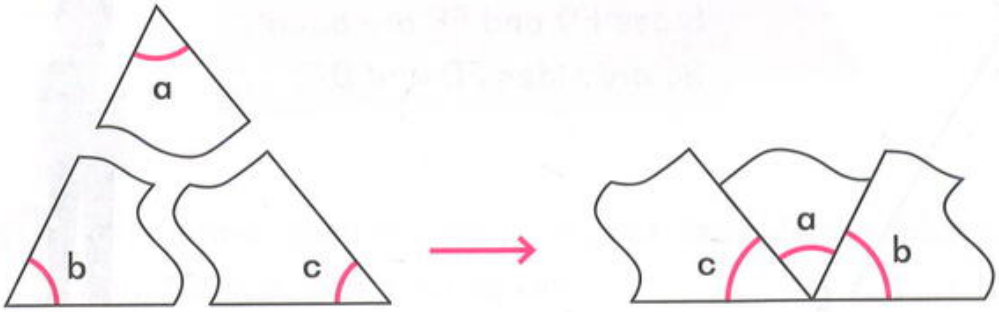
Use a ruler to draw a triangle and label the interior angles a, b, and c. Cut out the triangle.





Try to make your triangle look different from all your friends' triangles.

Cut off the 3 angles of the triangle you cut out and arrange them as shown.



What do you notice about the sum of the interior angles of a triangle?

Learn

$\angle a + \angle b + \angle c = 180°$

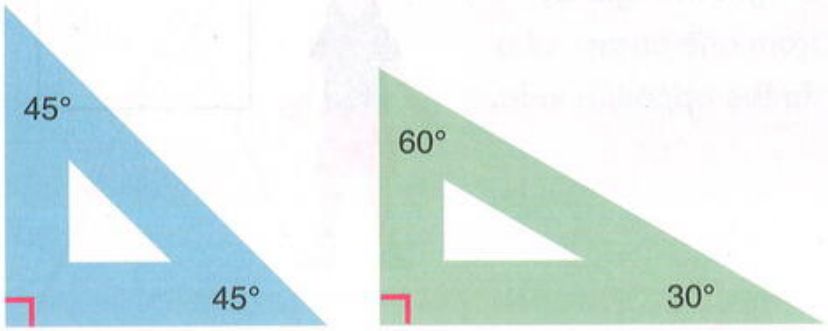


The three angles of the triangle formed a straight angle. Did this happen with the triangles your friends made too?

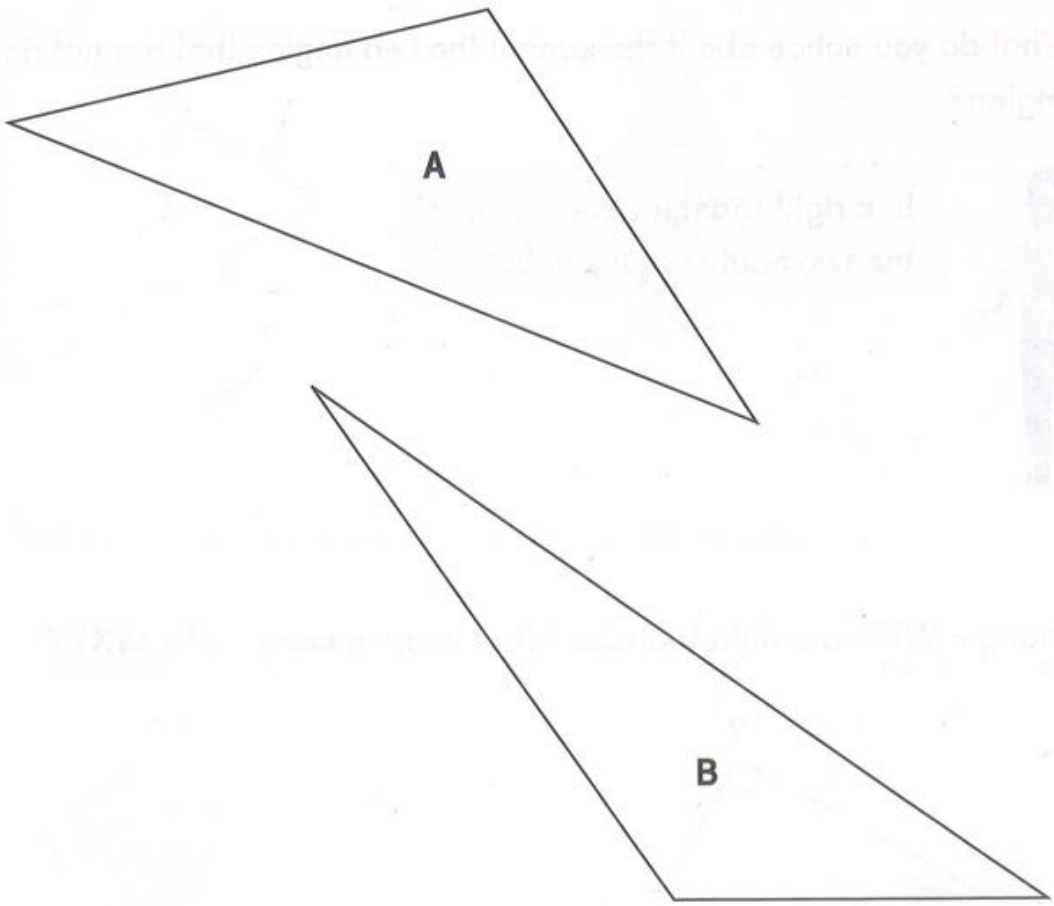
The sum of the interior angles of a triangle is 180°.

Do

1 What is the sum of the interior angles of each set square?



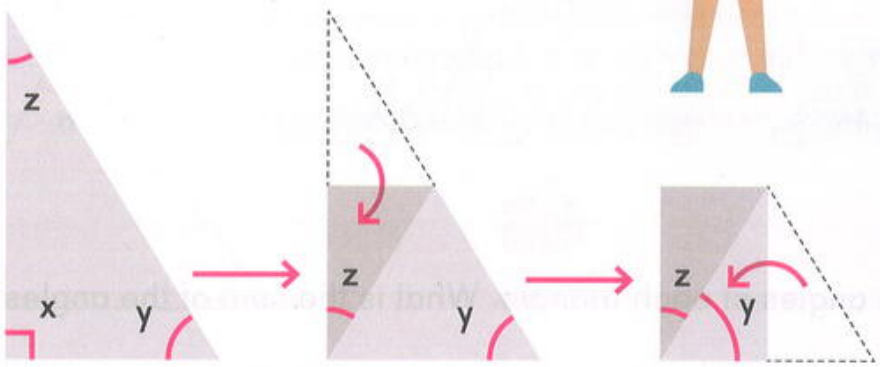
2 Measure the angles of each triangle. What is the sum of the angles?



3 Cut out and fold a right triangle as shown.

You can make a right triangle by drawing a line from one corner of a piece of paper to the opposite side.



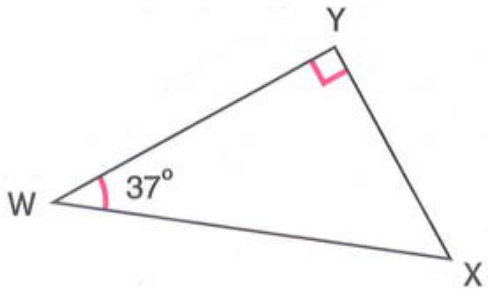


What do you notice about the sum of the two angles that are not right angles?

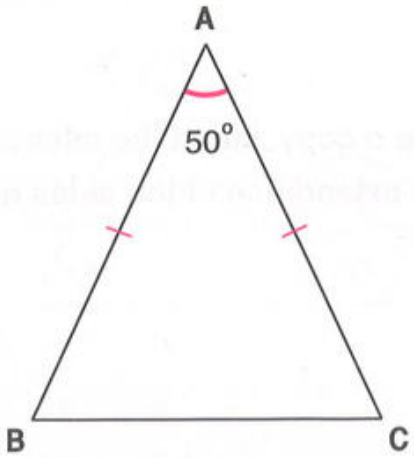


In a right triangle, the sum of the two acute angles is 90°.

4 Triangle WYX is a right triangle. What is the measure of ∠WXY?



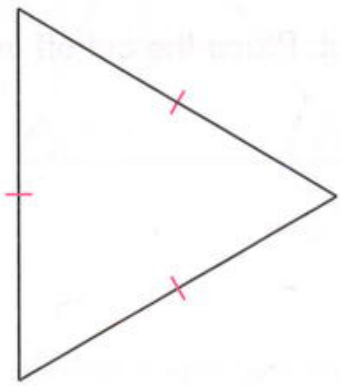
5 Triangle BAC is an isosceles triangle. What is the measure of ∠BCA?



∠ABC = ∠BCA
180° − 50° = 130°
130° ÷ 2 = ?



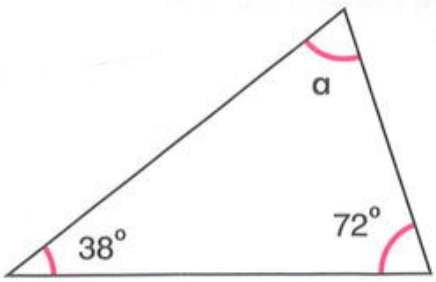
6 What is the measure of all three angles in every equilateral triangle?

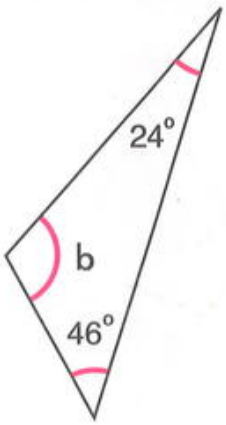


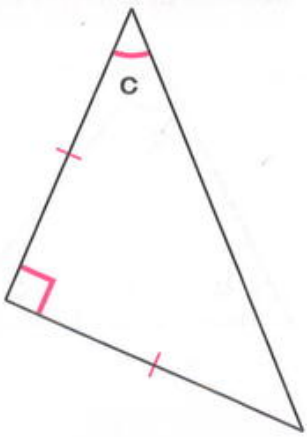


180° ÷ 3 = ?

7 Find the measures of the unknown marked angles.







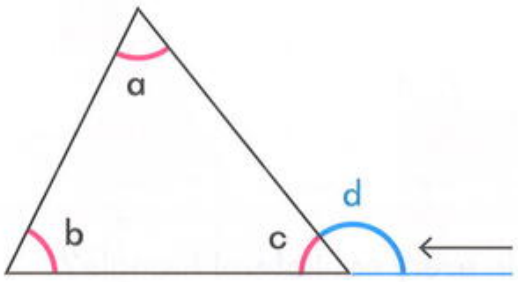
Exercise 4 • page 76

Lesson 5
The Exterior Angle of a Triangle

5

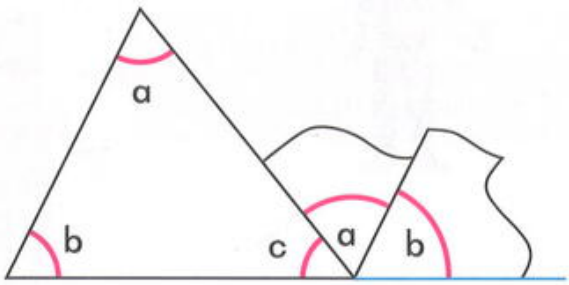
Think

Draw a triangle. Cut it out and then use it to trace a copy. Label the interior angles of both triangles the same. Use a ruler to extend one of the sides as shown and label the new angle, as shown.

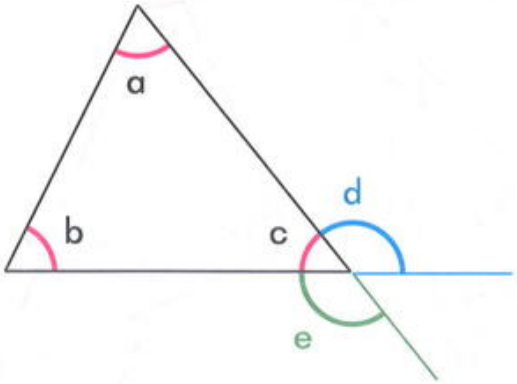


← **Exterior angle**

(a) Cut off angles a and b of the triangle you cut out. Place the cut off angles on top of Angle d. What do you notice?

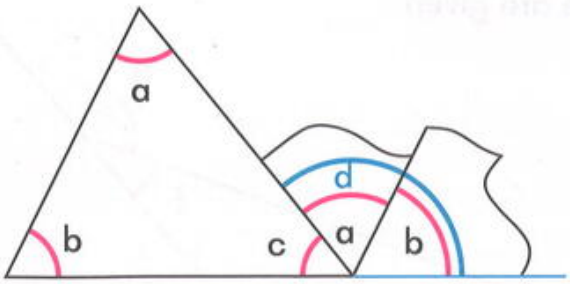


(b) Extend the other side of the triangle to form another exterior angle at the same vertex. What can you say about the measure of ∠e?



Learn

(a) $\angle d = \angle a + \angle b$

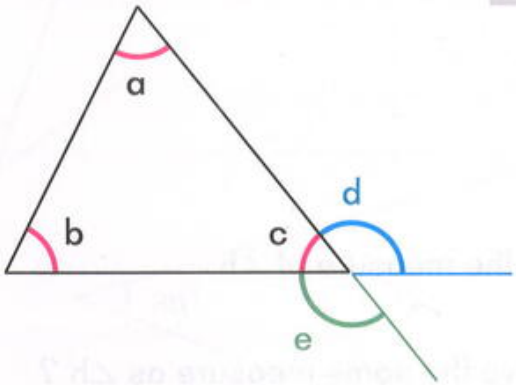


Angles a and b are opposite the exterior Angle d.



(b) $\angle e = \angle d$

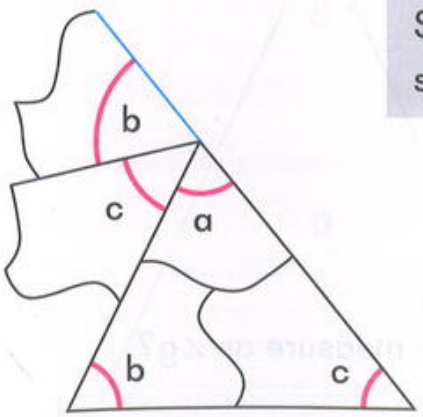
$\angle e = \angle a + \angle b$



Angles e and d are vertical angles, so $\angle e = \angle d$. Since $\angle d = \angle a + \angle b$, then...



The exterior angle of a triangle is equal to the sum of the interior angles opposite it.

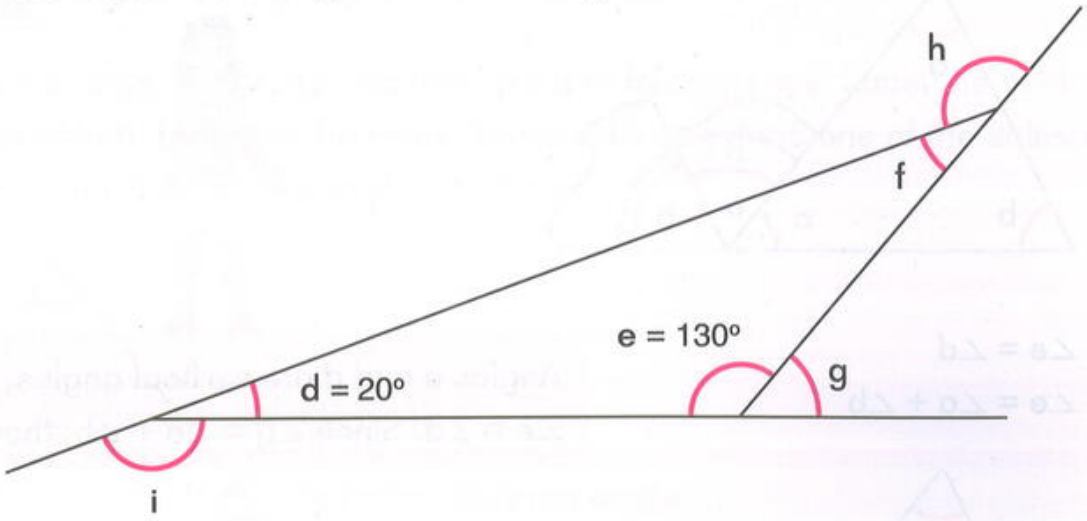


See if other exterior angles are equal to the sum of the interior angles opposite each one.



Do

1 The triangle below shows an exterior angle for each of the three vertices. The measures of angles d and e are given.



(a) What is the measure of $\angle f$?

(b) Use the measure of $\angle f$ to find the measure of $\angle h$.

(c) Which two angles together have the same measure as $\angle h$?



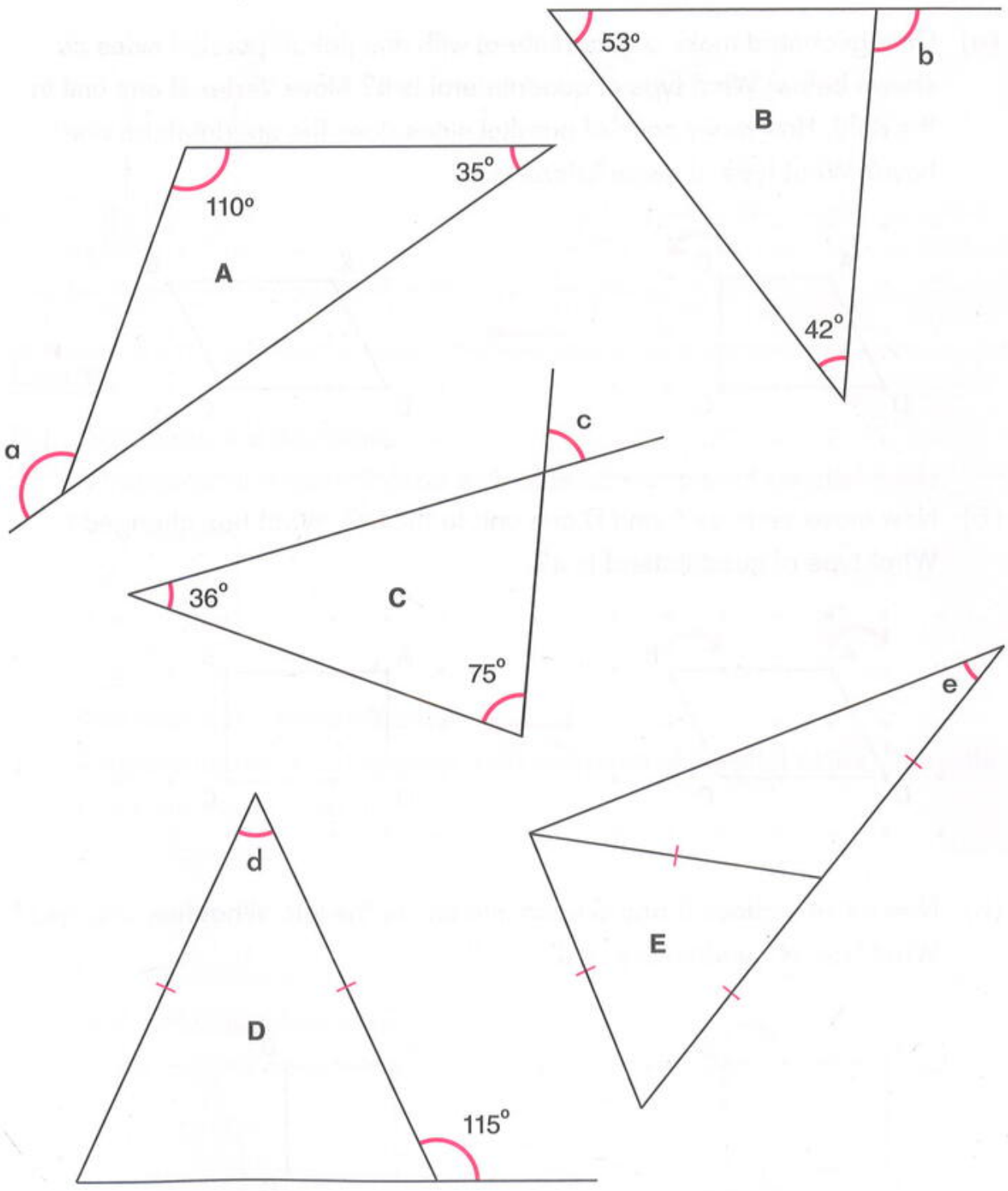
$180° - \angle f = \angle d + \angle e$
$180° - \angle f = \angle h$
So, $\angle h = \angle d + \angle e$

(d) What are the measures of $\angle g$ and $\angle i$?

(e) Which two angles together have the same measure as $\angle g$?

(f) Which two angles together have the same measure as $\angle i$?

2 Find the measures of the unknown marked angles. All marked exterior angles are formed by extending a side of the triangle.



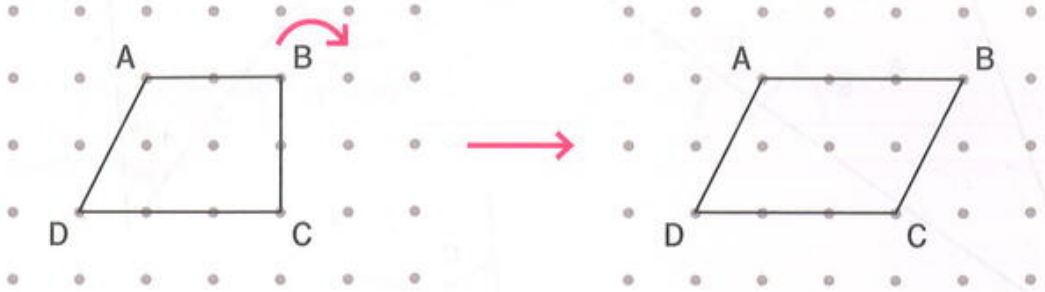
Exercise 5 • page 81

Lesson 6
Classifying Quadrilaterals

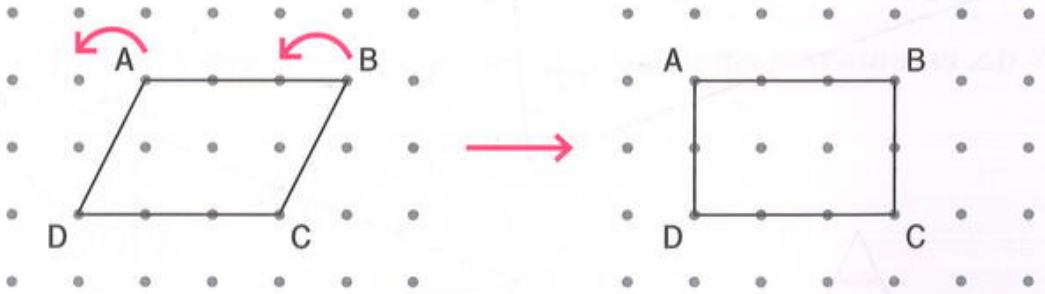
6

Think

(a) On a geoboard make a quadrilateral with one pair of parallel sides as shown below. What type of quadrilateral is it? Move Vertex B one unit to the right. How many pairs of parallel sides does the quadrilateral now have? What type of quadrilateral is it?



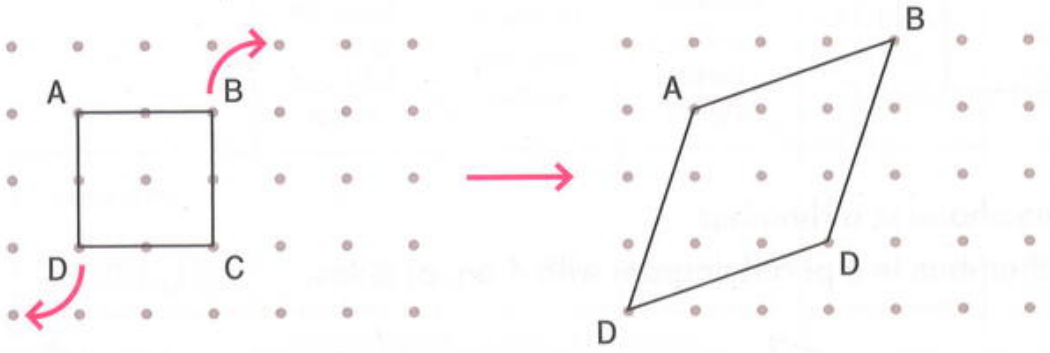
(b) Now move vertices A and B one unit to the left. What has changed? What type of quadrilateral is it?



(c) Now move vertices B and C each one unit to the left. What has changed? What type of quadrilateral is it?

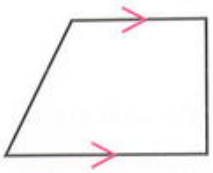


(d) Now move vertices B and D as shown. Does the quadrilateral still have two pairs of parallel sides? Compare the lengths of the sides. What type of quadrilateral is the new shape?

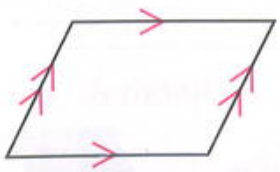


Learn

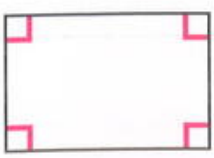
(a) This shape is a trapezoid.
A trapezoid is a quadrilateral with at least one pair of parallel sides.



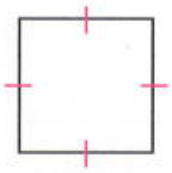
This shape is a parallelogram.
A parallelogram is a trapezoid with two pairs of parallel sides. Opposite sides are equal in length.



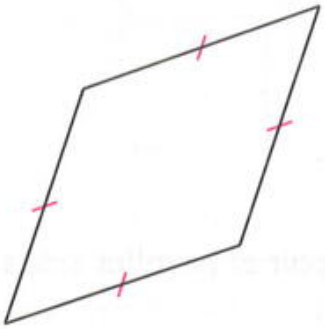
(b) This shape is a rectangle.
A rectangle is a parallelogram with four right angles.

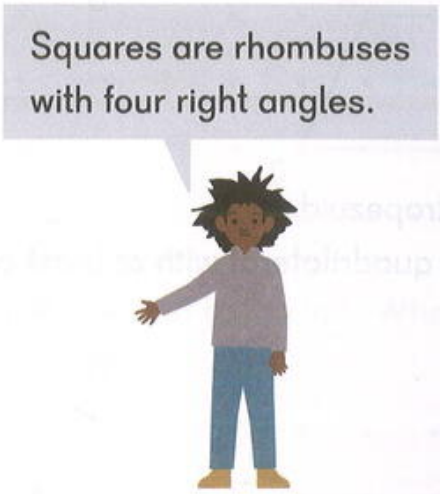


(c) This shape is a square.
A square is a rectangle with four equal sides.

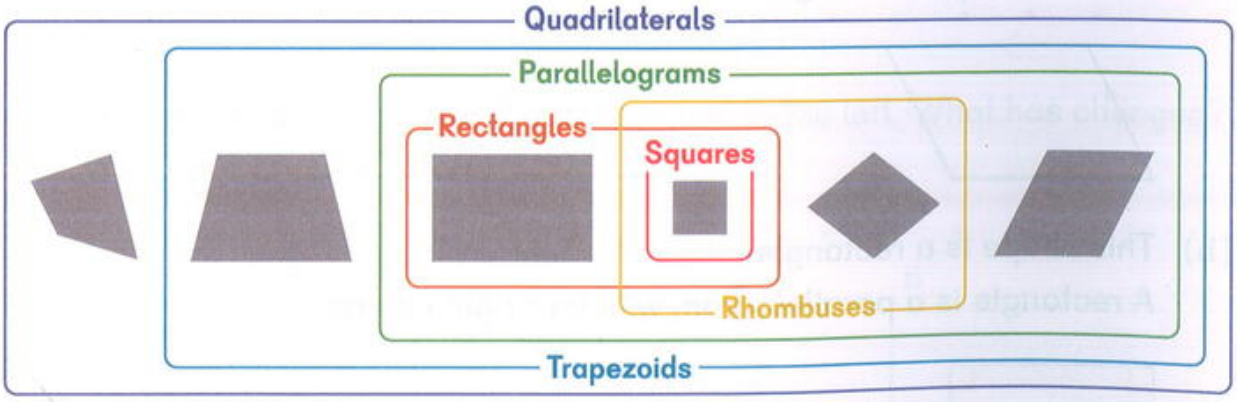


(d) This shape is a rhombus.
A rhombus is a parallelogram with 4 equal sides.





We can show the relationship among quadrilaterals using the following diagram.



Do

1 Copy and complete the table by putting a check in the appropriate spaces.

	At least 1 set of parallel sides	2 sets of parallel sides	Opposite sides equal length	All sides equal length	4 right angles
Trapezoid	✓				
Parallelogram					
Rhombus					
Rectangle					
Square					

2 Draw the following quadrilaterals on graph paper. Compare your quadrilaterals with the ones your friends drew.

(a) A trapezoid with one pair of parallel sides.

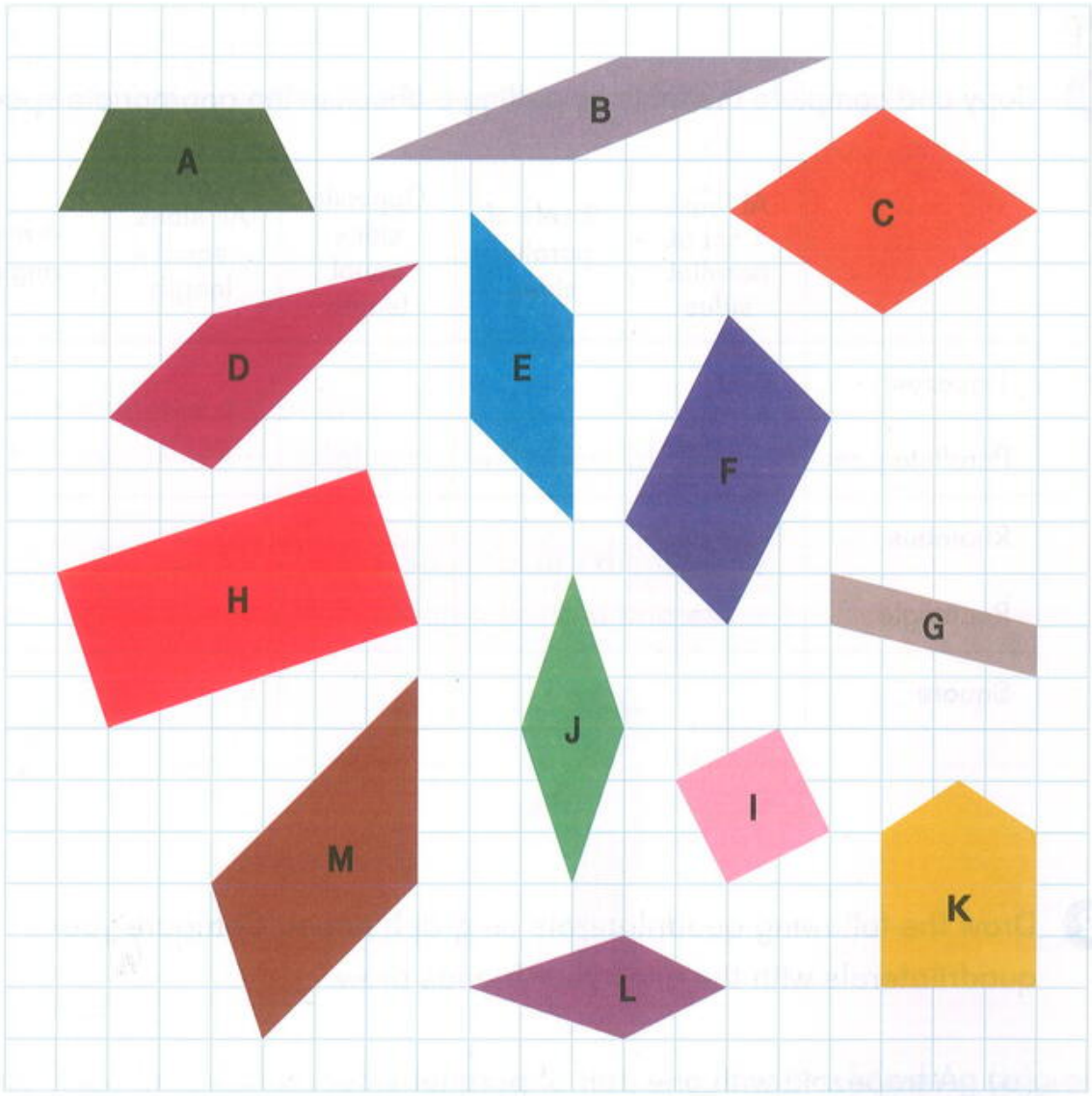
(b) A parallelogram that is not a rectangle.

(c) A rhombus that is not a square.

(d) A rectangle.

(e) A square.

3



Which of the figures above are:

(a) trapezoids

(b) parallelograms

(c) rhombuses

(d) rectangles

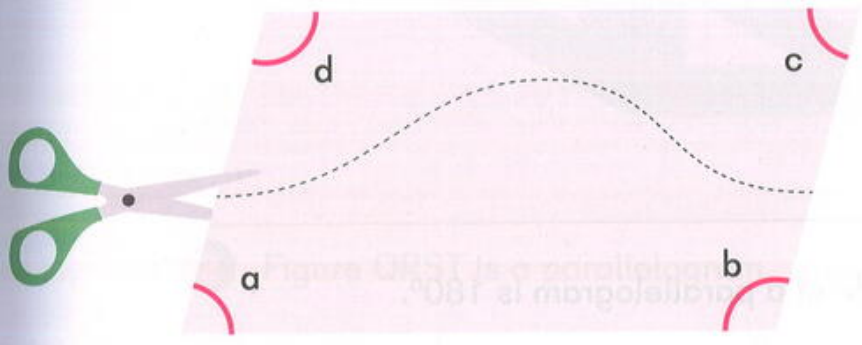
Exercise 6 • page 85

Lesson 7
Angles of Quadrilaterals — Part 1

7

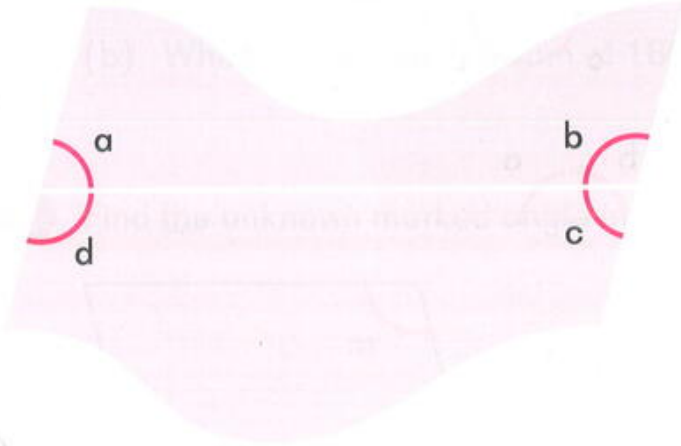
Think

Use graph paper to draw a parallelogram. Label the angles.
Then cut it out.



Match the angles in different ways as shown.

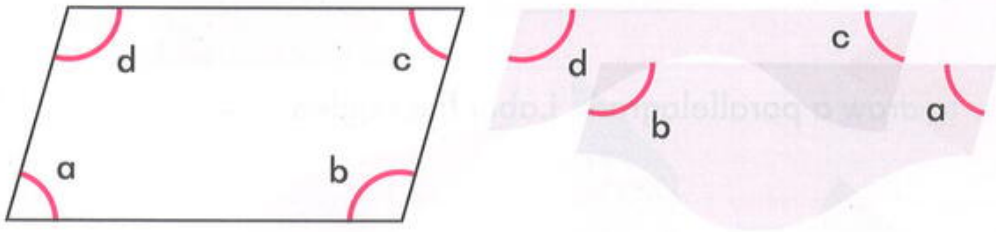




What do you notice about the angles of the parallelogram?

Learn

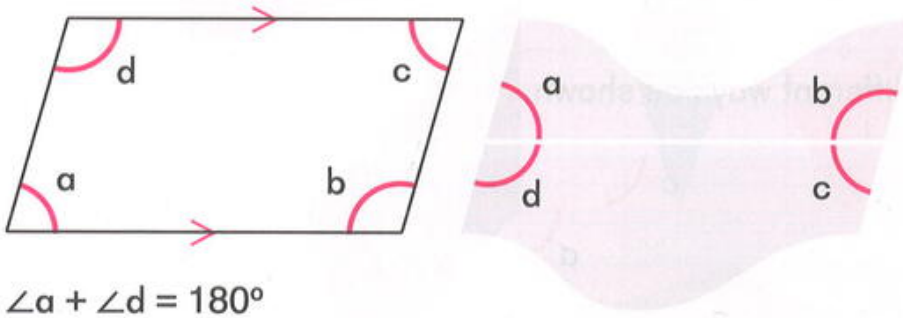
Opposite angles of a parallelogram are equal.



$\angle a = \angle c$

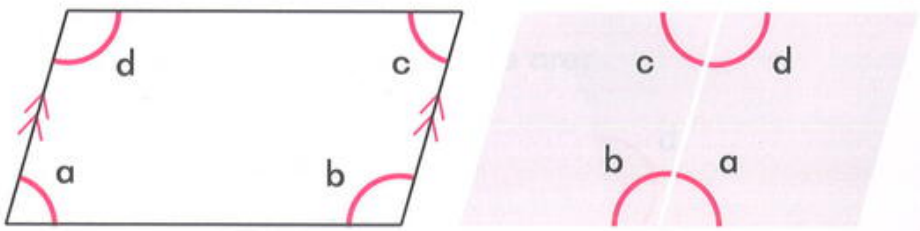
$\angle b = \angle d$

The sum of angles on the same side of a parallelogram is 180°.



$\angle a + \angle d = 180°$

$\angle b + \angle c = 180°$

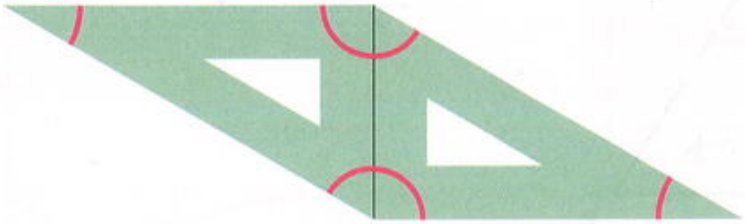


$\angle d + \angle c = 180°$

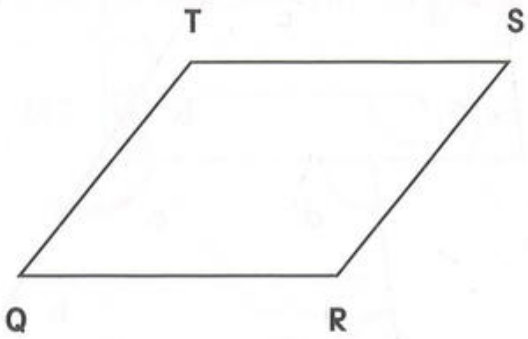
$\angle a + \angle b = 180°$

Do

1 Put two similar set squares together as shown to make a quadrilateral and trace around it. What are the measures of the interior angles? What kind of quadrilateral is it?



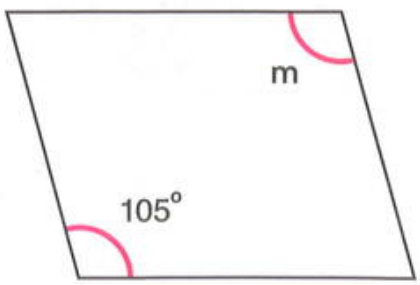
2 Figure QRST is a parallelogram.

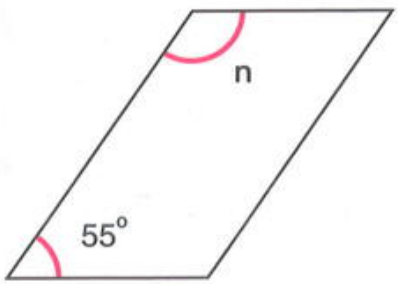


(a) Which angles have equal measures?

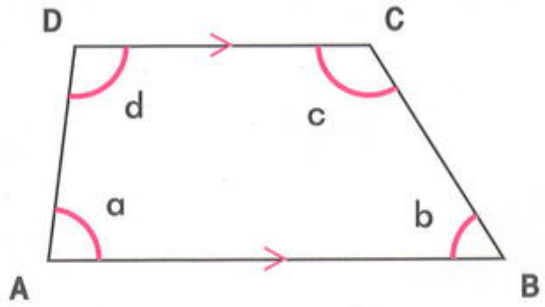
(b) Which angles have a sum of 180°?

3 Find the unknown marked angle in each parallelogram.

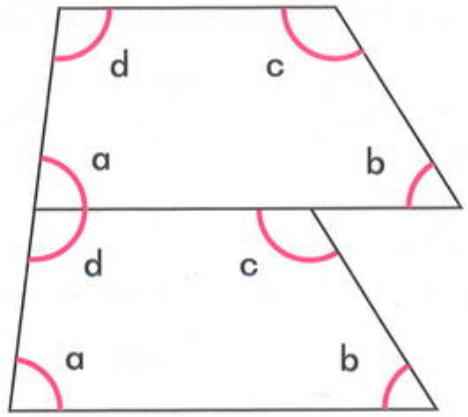


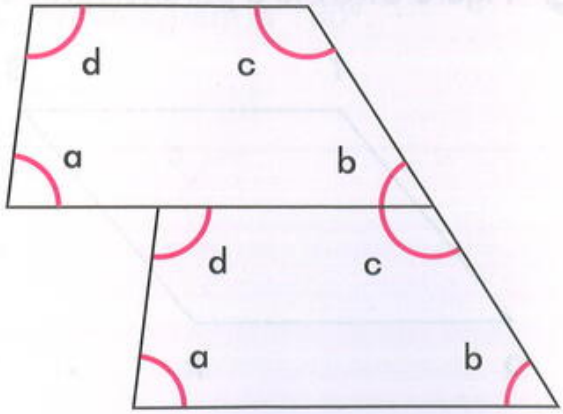


4 In Trapezoid ABCD, sides DC and AB are parallel. Trace the trapezoid twice and cut out both copies. Find pairs of angles that have a sum of 180°.



Which pairs of angles have a sum of 180°?



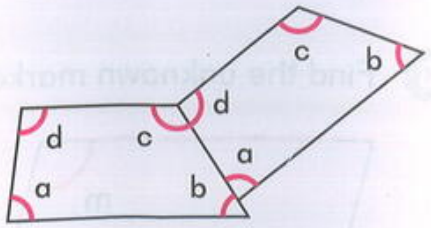


$\angle a + \angle d = 180°$
$\angle b + \angle c = 180°$

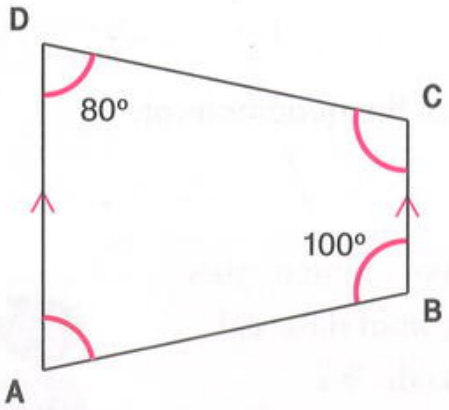


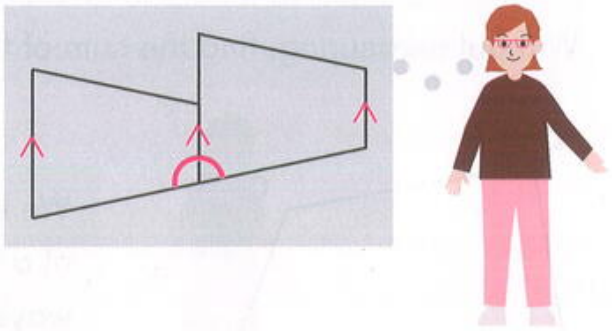
Do angles c and d have a sum of 180°? What about angles a and b?





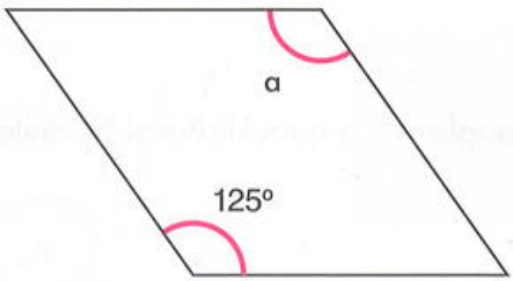
5 In Trapezoid ABCD, sides AD and BC are parallel. What are the measures of ∠BCD and ∠DAB?



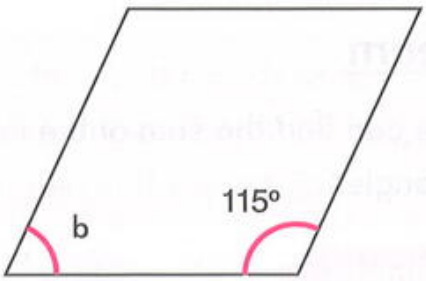


6 Find the measures of the unknown marked angle in each rhombus.

(a)

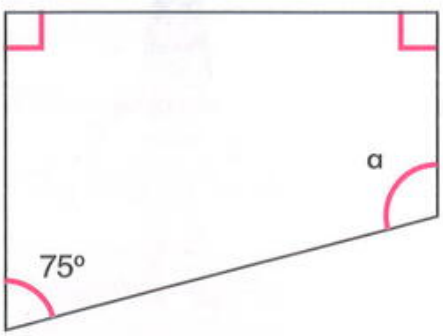


(b)

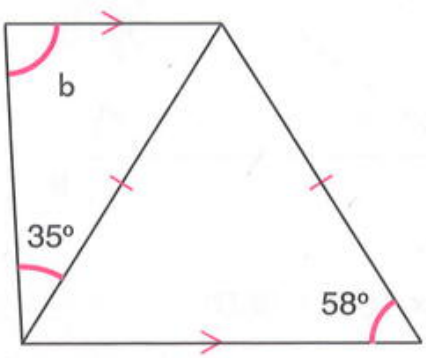


7 Find the measures of the unknown marked angle in each trapezoid.

(a)



(b)



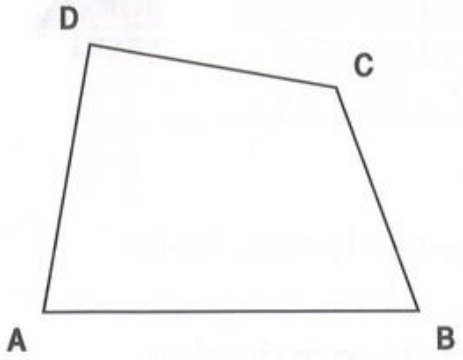
Exercise 7 • page 89

Lesson 8
Angles of Quadrilaterals — Part 2

8

Think

Without measuring, find the sum of the angles of the quadrilateral.



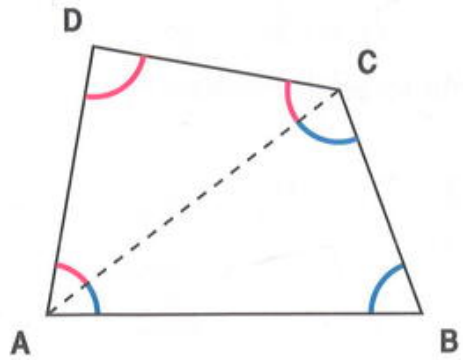
We know the sum of the angles of a triangle. In what different ways can we divide the quadrilateral into triangles?



Learn

We can find the sum of the interior angles of a quadrilateral by dividing it into triangles.

Method 1

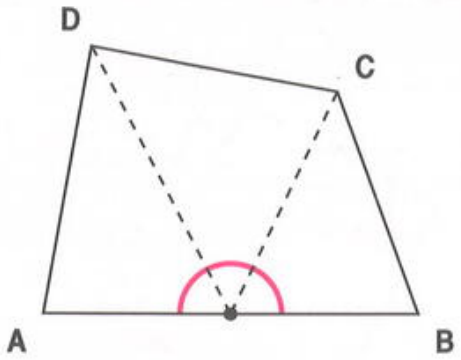


I connected the points at opposite vertices to make two triangles. The sum of the angles of each triangle is 180°.



$2 \times 180° = 360°$

Method 2



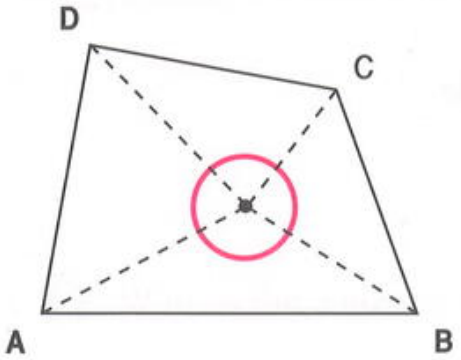
I drew a point on Side AB and made three triangles. The angles that meet at the point are not angles in the quadrilateral.



$3 \times 180° - 180° = 540° - 180°$

$= 360°$

Method 3



I drew a point in the middle and made four triangles. The angles that meet at the point are not angles of the quadrilateral.



$4 \times 180° - 360° = 720° - 360°$

$= 360°$

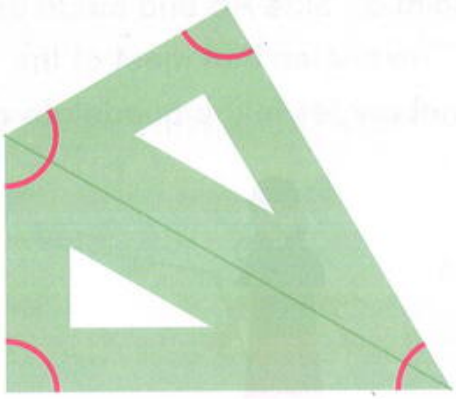
The sum of the interior angles of a quadrilateral is 360°.



No matter how many triangles we divide the quadrilateral into, the answer will be the same.

Do

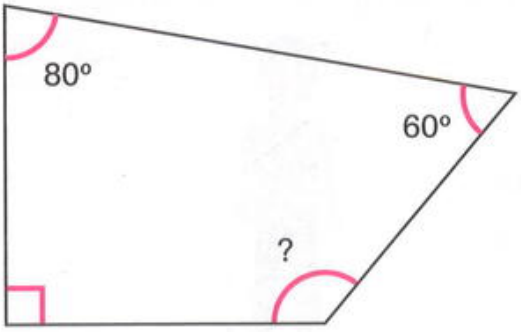
1 Put two set squares together to form a quadrilateral, as shown below.



(a) What is the measure of each of the angles of the quadrilateral?

(b) What is the sum of the measures of the angles of the quadrilateral?

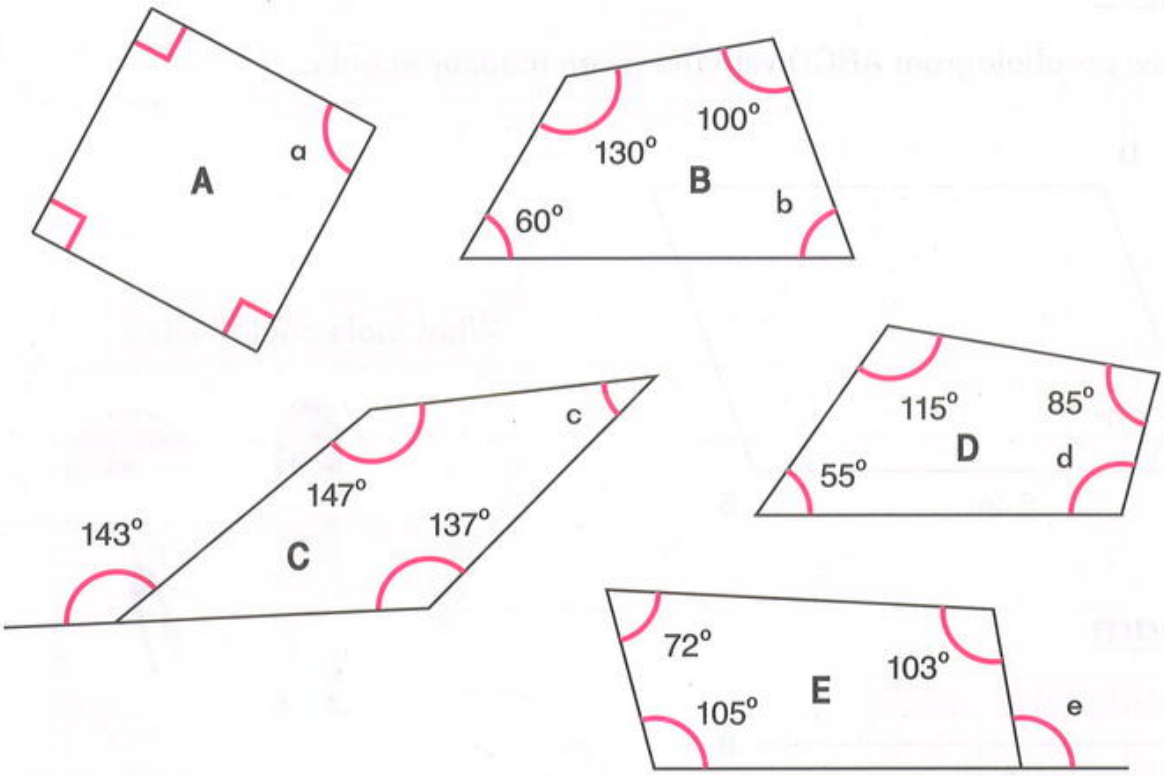
2 Find the measure of the unknown marked angle.



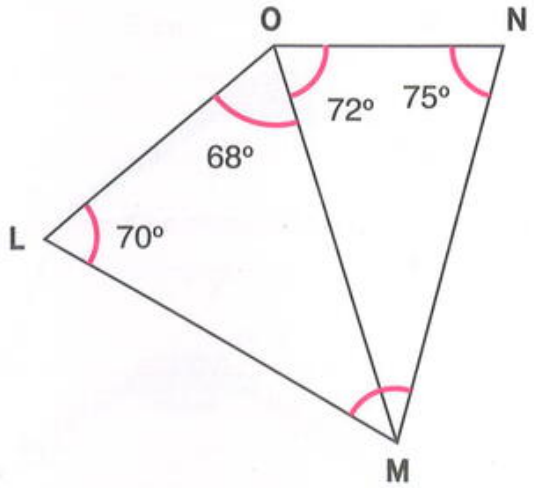
$360° - (80° + 60° + 90°)$



3 Find the measure of the unknown marked angles. All exterior angles are formed by extending a side of the quadrilateral.



4 What is the measure of ∠LMN?



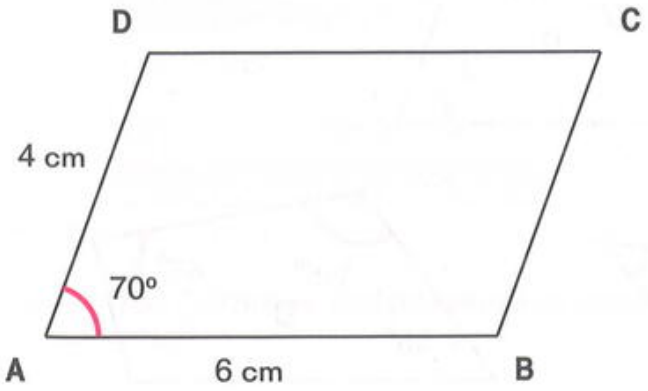
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Lesson 9
Drawing Triangles and Quadrilaterals

9

Think

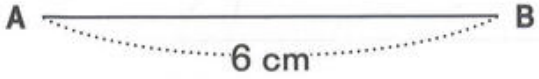
Draw parallelogram ABCD with the given measurements.

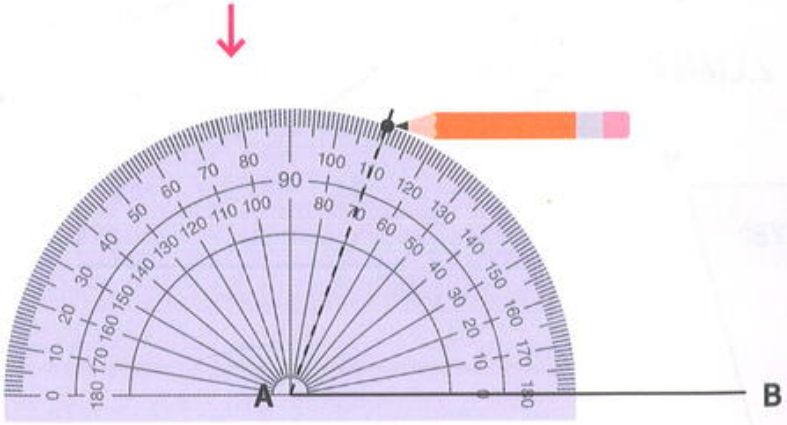


What tools could I use?

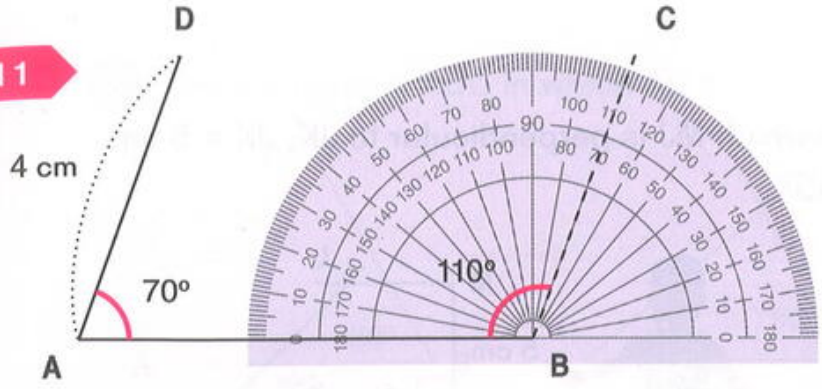


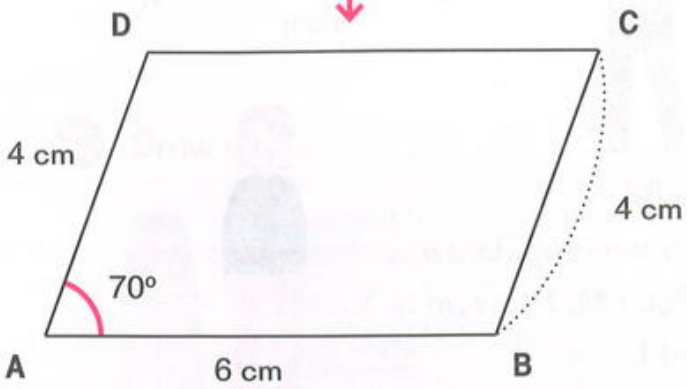
Learn



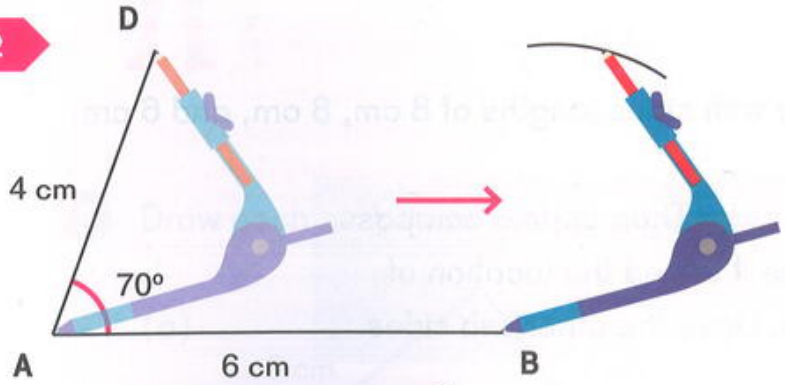


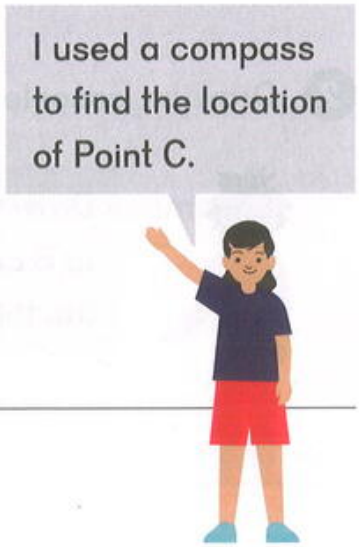
Method 1

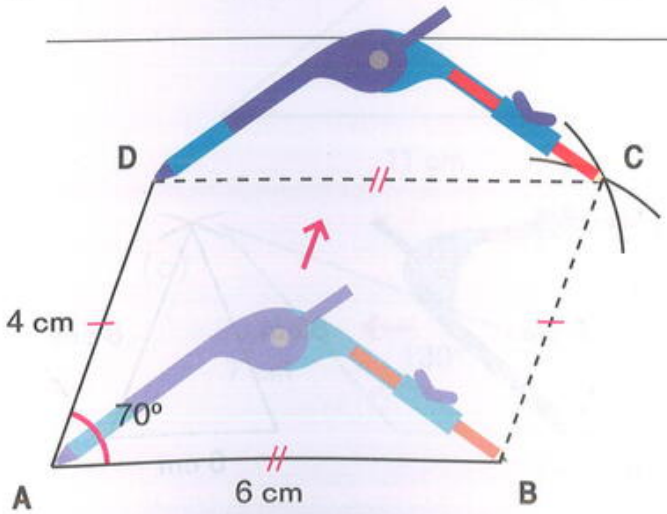




Method 2





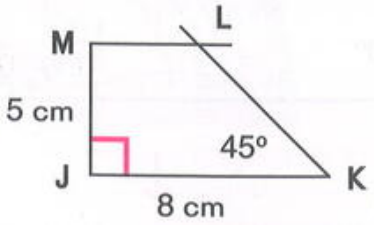


Do

1 Draw a trapezoid JKLM in which MJ is perpendicular to JK, JK = 8 cm, JM = 5 cm, and ∠JKL = 45°.

Draw a rough sketch first to get an idea of what it should look like.





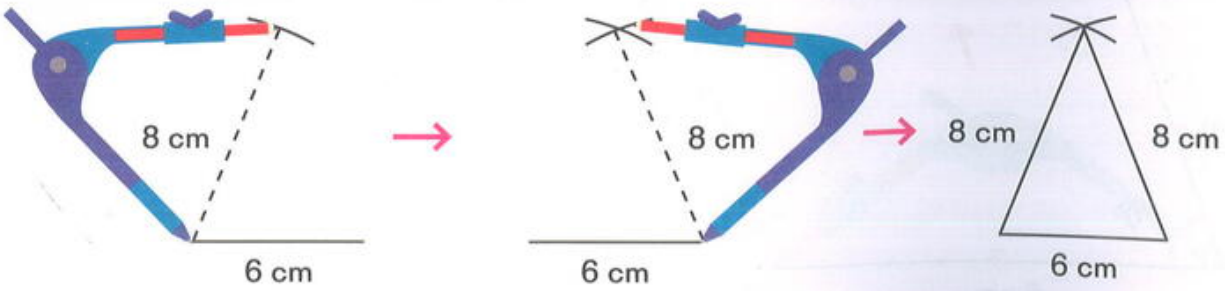
Draw JK 8 cm long. Draw Line JM perpendicular to JK at Point J 5 cm long. Draw a line perpendicular to JM at Point M. Draw an angle of size 45° to locate Point L.



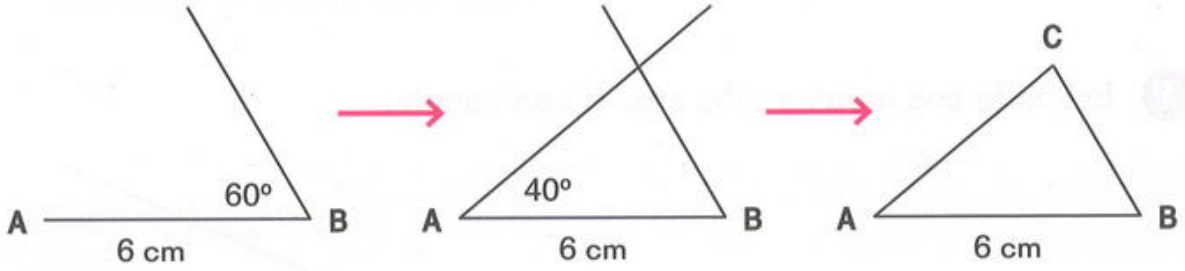
2 Draw an isosceles triangle with sides lengths of 8 cm, 8 cm, and 6 cm.



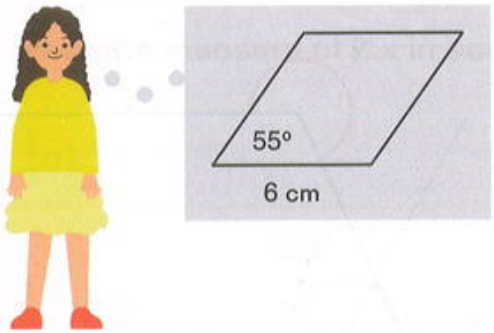
Draw the 6 cm side. Then open a compass to 8 cm and use it to find the location of the third vertex. Draw the other two sides.



3 Draw a triangle ABC in which AB = 6 cm, $\angle ABC = 60°$, and $\angle CAB = 40°$.

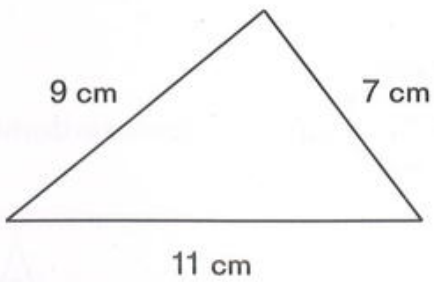


4 Draw a rhombus with one side 6 cm long and one angle of 55°.

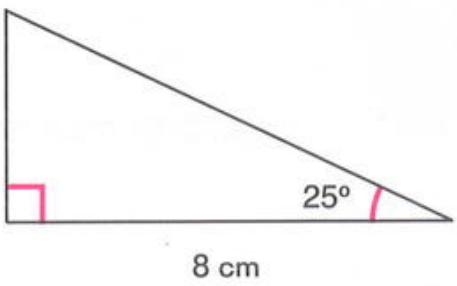


5 Draw each of the following triangles with the given measurements.

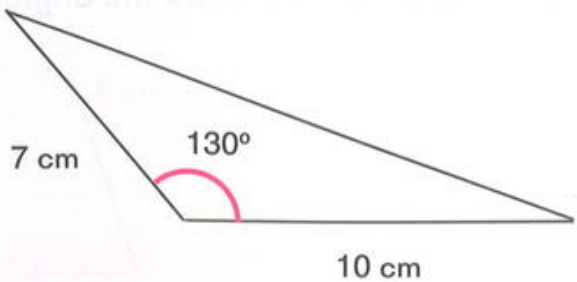
(a)



(b)

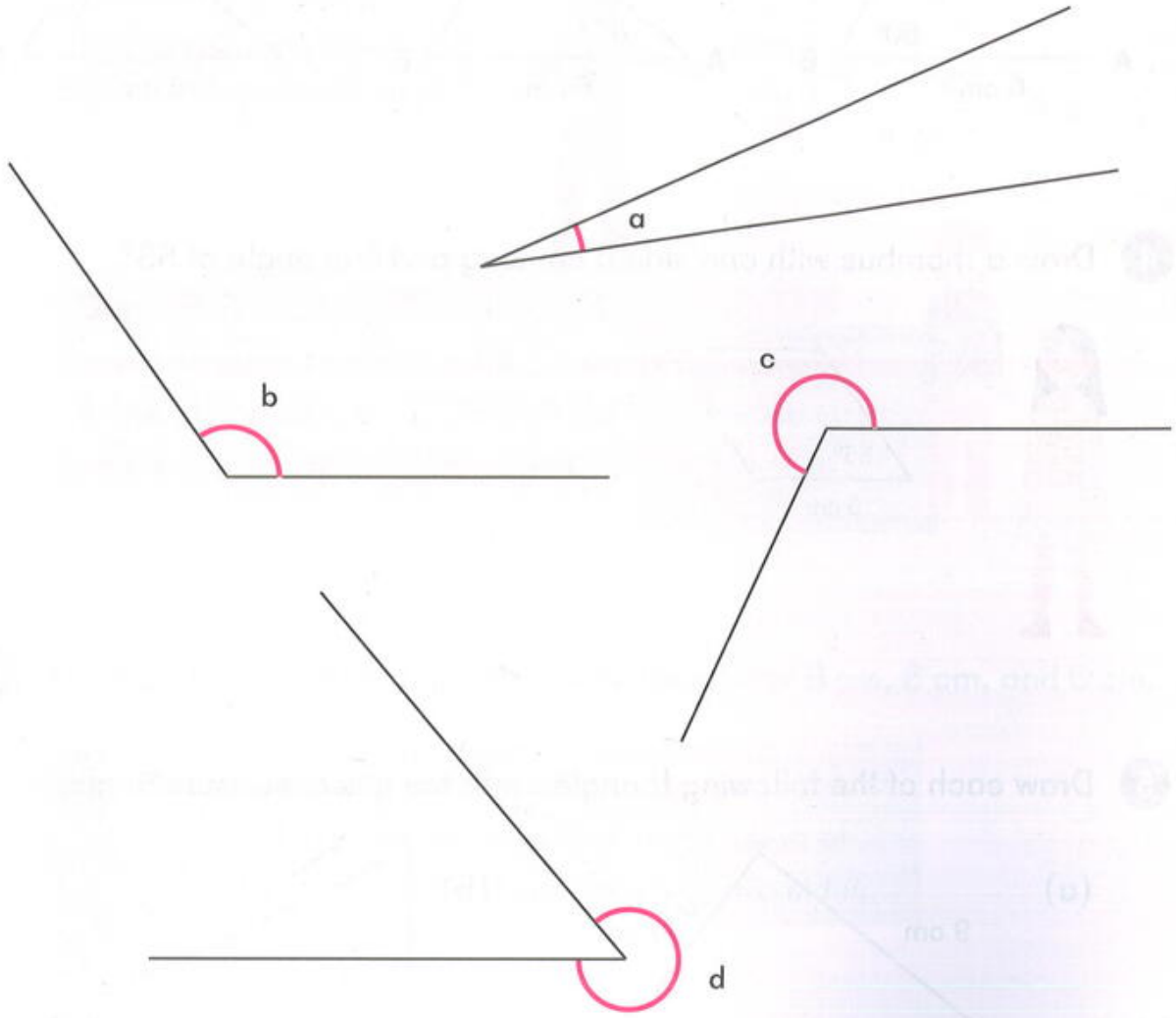


(c)



Exercise 9 • page 96

1 Estimate and measure the size of each angle.

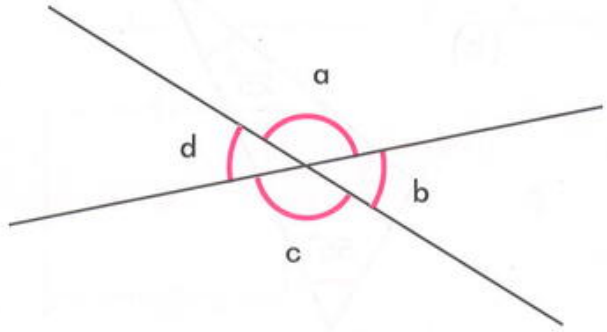


2 Draw angles with the following measurements. Mark the angle.

(a) 200°

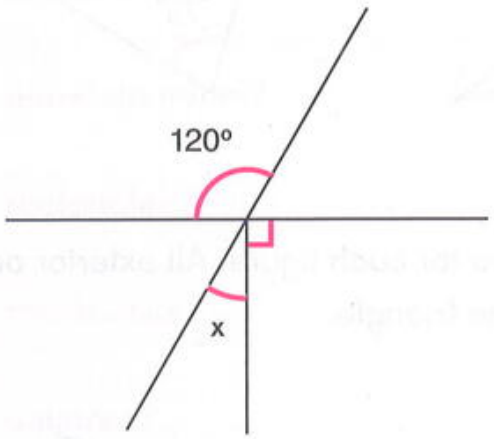
(b) 330°

3 Two straight lines intersect as shown below. $\angle a = 137°$. What are the measures of angles b, c, and d?

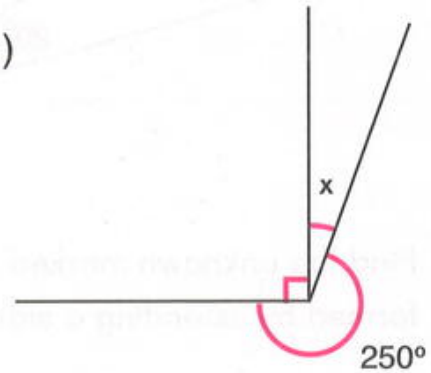


4 Find the measure of $\angle x$ in each figure.

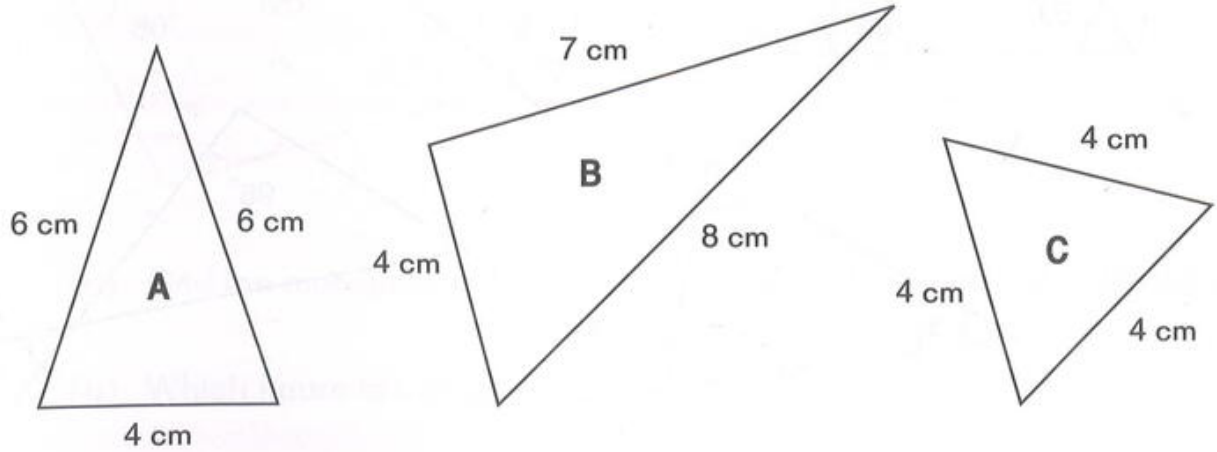
(a)



(b)

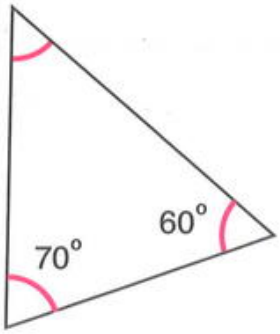


5 Tell whether each triangle is equilateral, isosceles, or scalene.

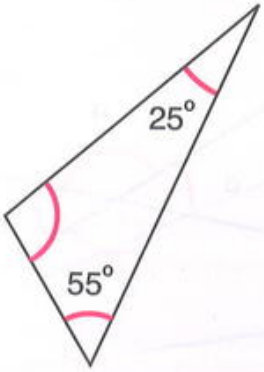


6 Find the missing interior angle measurement. Then tell whether each triangle is acute, obtuse, or right.

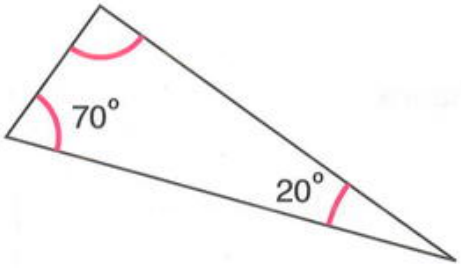
(a)



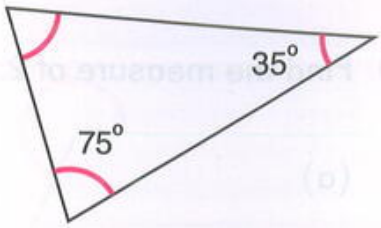
(b)



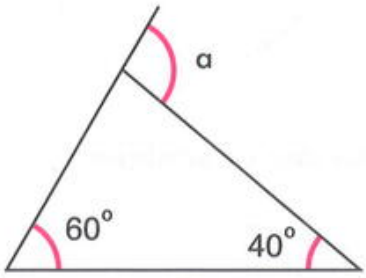
(c)

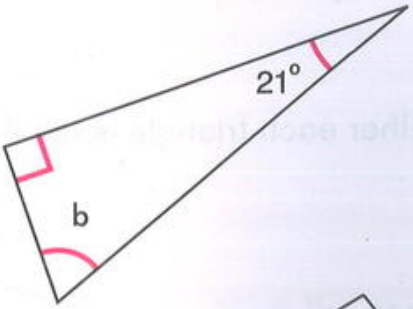


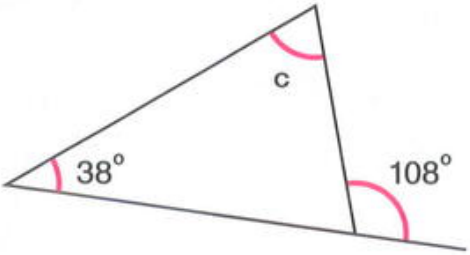
(d)

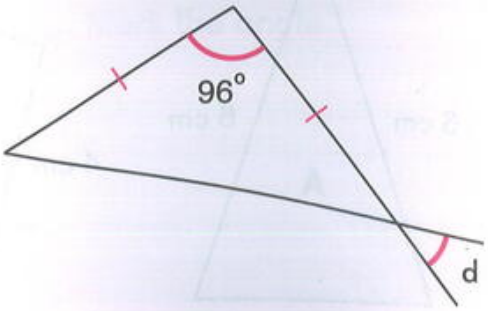


7 Find the unknown marked angles for each figure. All exterior angles are formed by extending a side of the triangle.

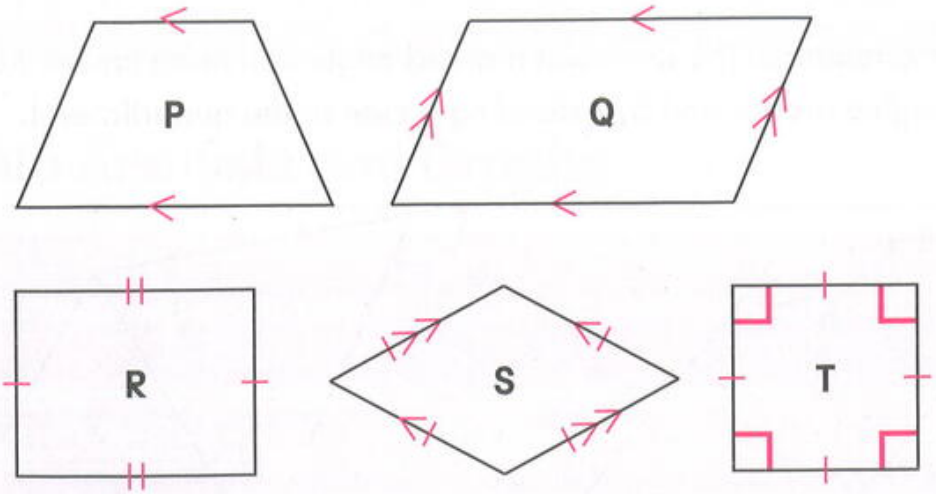








8



Which shapes above are...

(a) trapezoids?

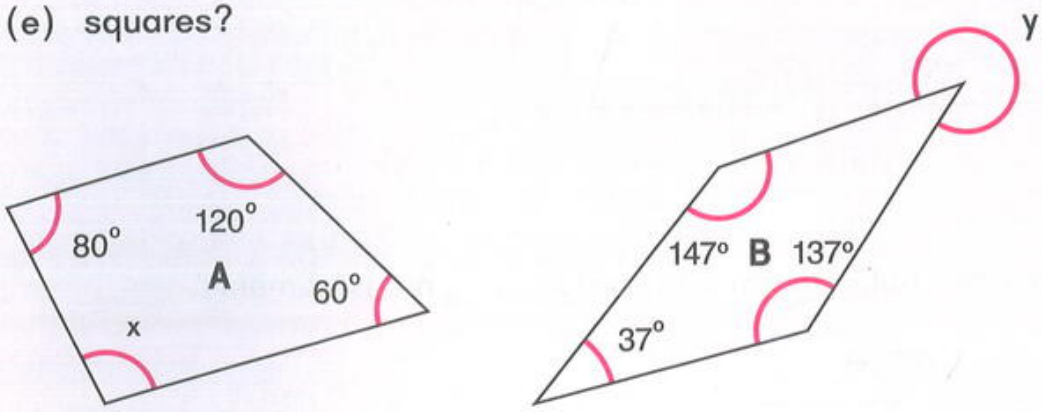
(b) parallelograms?

(c) rectangles?

(d) rhombuses?

(e) squares?

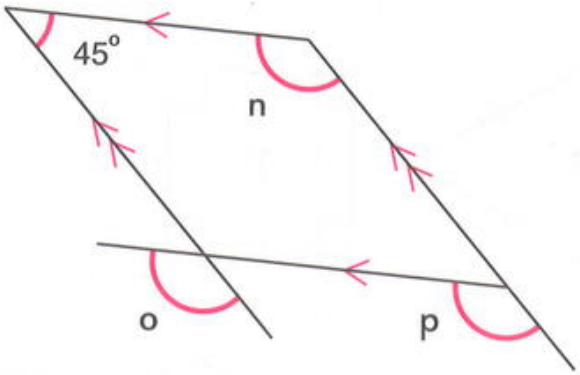
9

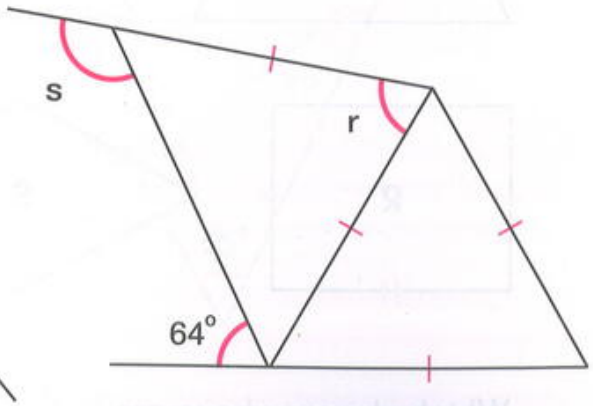


(a) Find the measures of the unknown angles in the quadrilaterals above.

(b) Which figure is a trapezoid?

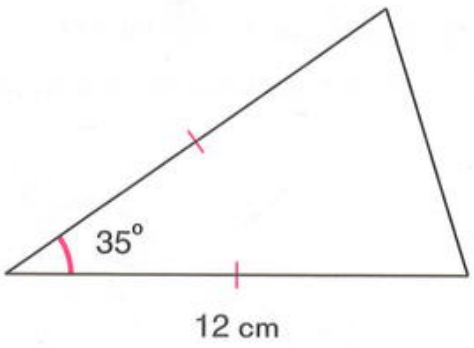
10 Find the measures of the unknown marked angles on each figure. All exterior angles are formed by extending a side of the quadrilateral.



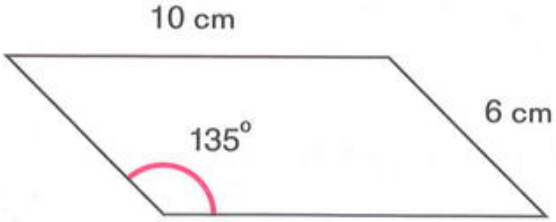


11 Draw an equilateral triangle with side 10 cm.

12 Draw an isosceles triangle with the following measurements.



13 Draw a parallelogram with the following measurements.

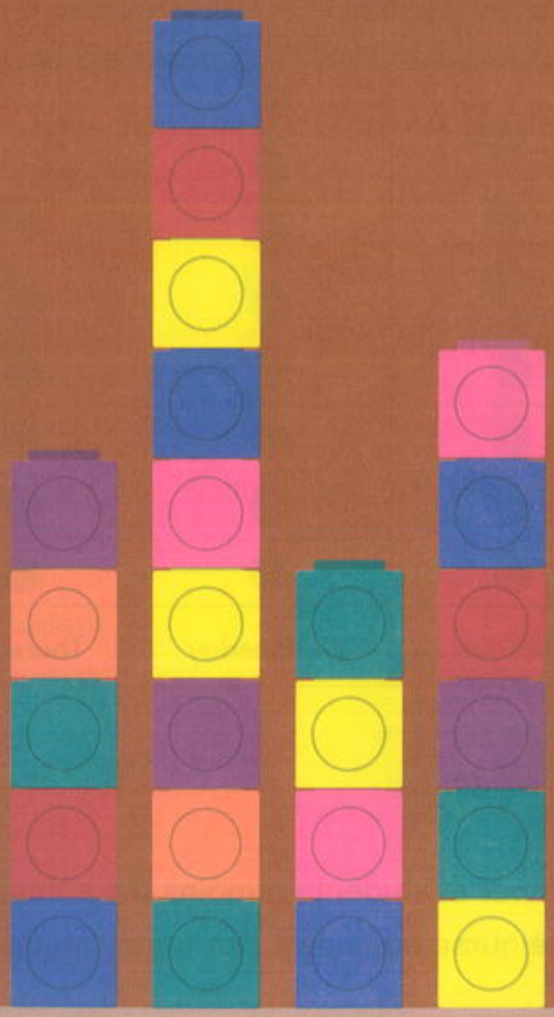


Exercise 10 • page 99

Chapter 12

Data Analysis and Graphs

How can we move some cubes so the stacks are the same height?

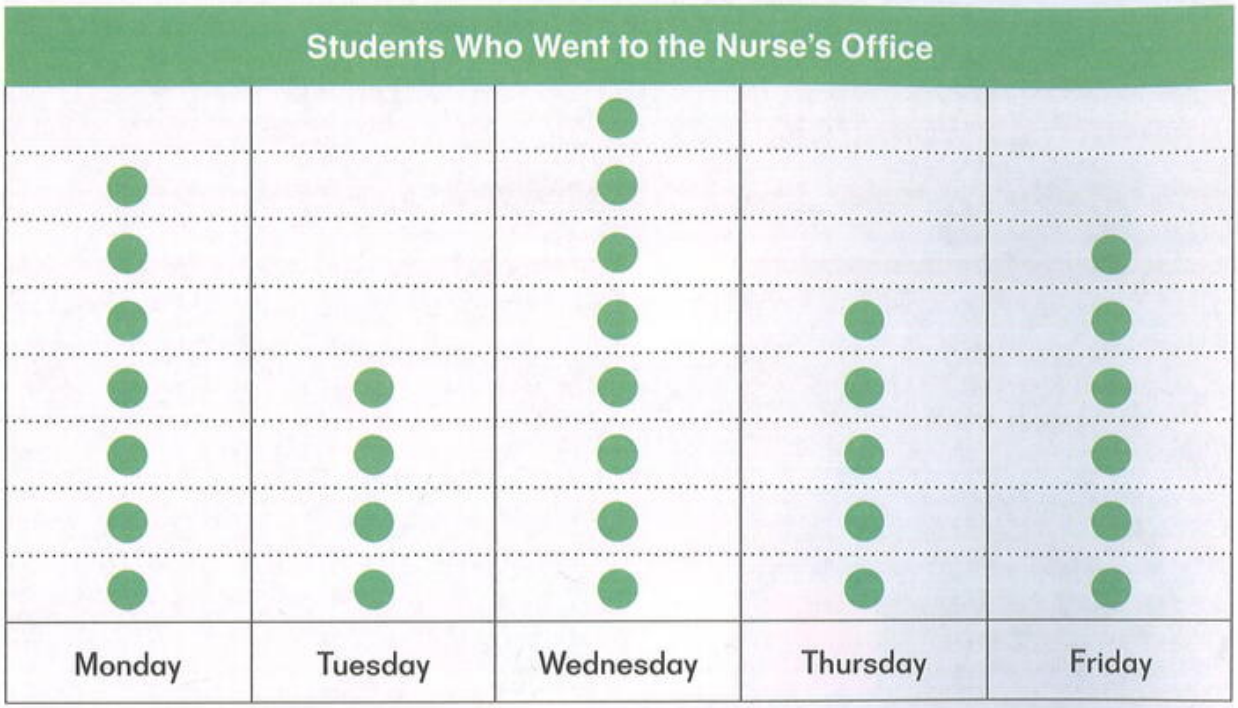


When the heights are evened out, how many cubes will be in each stack?



Think

The picture graph shows the number of students who went to the school nurse each day for a week.



Each ● stands for 1 student.

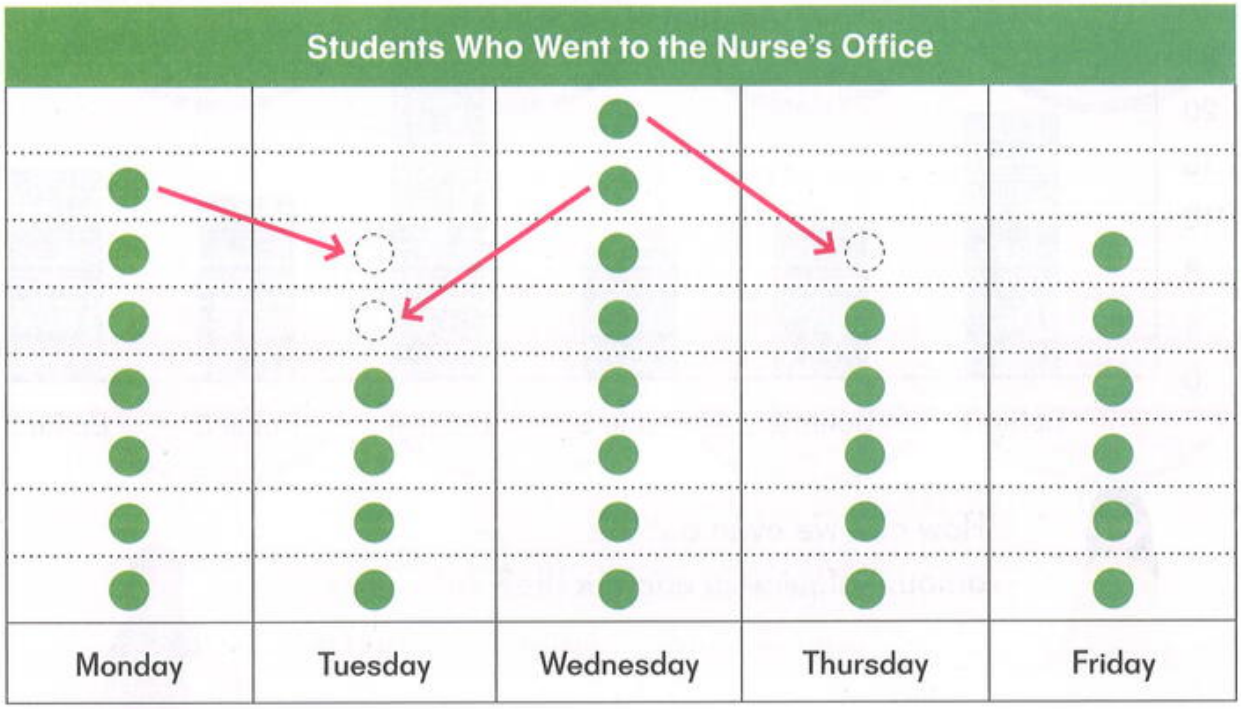
Suppose the total number of students remains the same, but the same number of students went to the nurse each day. How many students would have gone to the nurse each day?

How can I even out the ● so there are the same number for each day?



Learn

When we even out the values in a set of data, the evened out amount is called the **average** of the values.



Each ● stands for 1 student.

$(7 + 4 + 8 + 5 + 6) \div 5 = 30 \div 5$

$= 6$

On average, _____ students went to the nurse each day.

We changed the amount in each group but not the number of groups or the total.



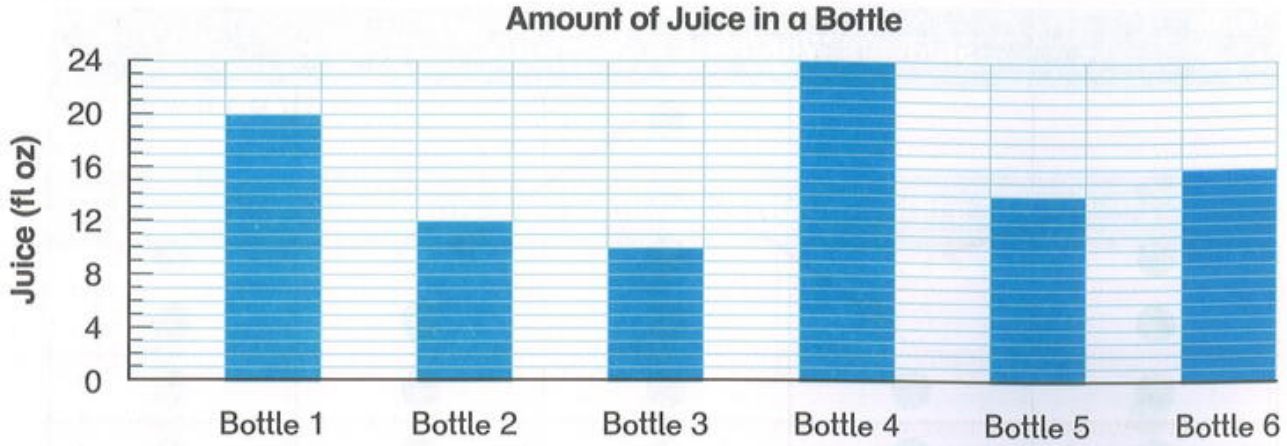
Average = Total Amount ÷ Number of Values

The average of a set of values is always between the smallest and greatest values.



Do

1 The bar graph shows the amount of juice in 6 bottles. What is the average amount of juice in each bottle?





How can we even out the amount of juice in each bottle?

$(20 + 12 + 10 + 24 + 14 + 16) \div$ ☐ = ☐

On average, each bottle has _____ fl oz of juice.

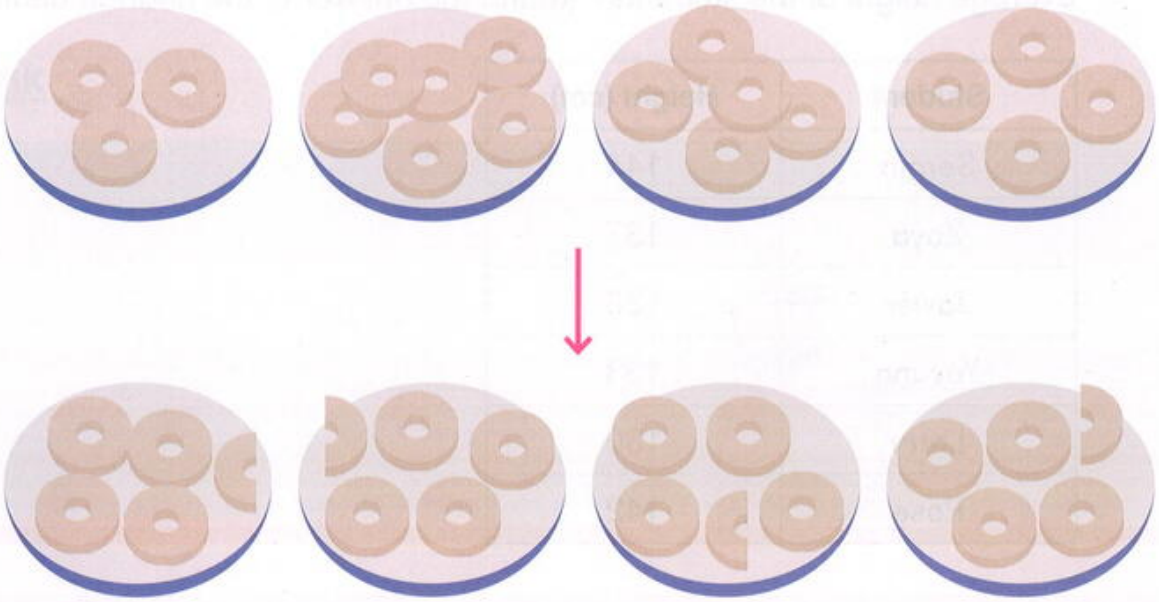
2 The table shows the number of books that were borrowed from the school library each day for a week. What is the average number of books that were borrowed each day?

Day	Monday	Tuesday	Wednesday	Thursday	Friday
Number of Books	2	4	8	6	0



We need to include Friday. Why?

3 What is the average number of donuts on each plate?





Express the answer as a decimal or as a mixed number in simplest form.

4 The table shows the number of points won for 8 games. What is the average number of points?

Game	1	2	3	4	5	6	7	8
Points	14	10	11	8	16	12	15	8



Even when each value has to be a whole number, does the average have to be a whole number?

5 The table shows the heights of the students in the math club. What is the average height of the students? Round the answer to the nearest centimeter.

Student	Height (cm)
Sergio	144
Zoya	137
Javier	138
Yovana	133
Larry	130
Rose	142

6 The table shows the number of books borrowed from a library each week for 4 weeks. What was the average number of books borrowed each week?

Week	Number of Books
1	1,567
2	2,034
3	1,849
4	2,112

7 Alex ran a total distance of 17.5 miles in 7 days. What is the average distance he ran each day?

8 The lengths of 3 ropes were marked as 12 ft, 10 ft 3 in, and $9\frac{1}{2}$ ft. What is the average length of the 3 ropes?

Exercise 1 • page 103

Think



Attempt	Distance (ft)
1	4.3
2	4.6
3	5.2
4	?

Dion made 4 long jumps. His average jump was 4.5 ft. On the first 3 jumps he jumped 4.3 ft, 4.6 ft, and 5.2 ft. How long was his fourth jump?

What is the total distance of all of his jumps?

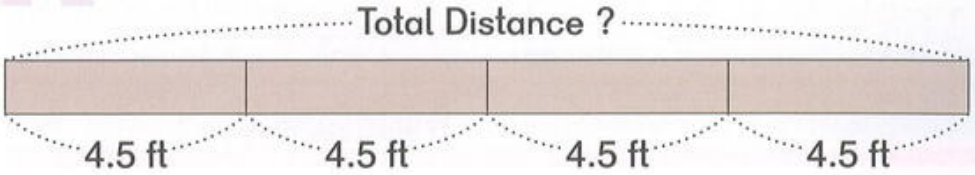


Learn

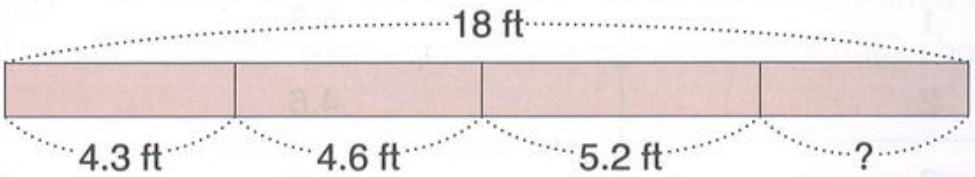
Suppose that each jump was 4.5 ft.



Average × Number of Values = Total



Total Distance = 4.5 × 4 = 18 ft





4.3 + 4.6 + 5.2 + ? = 18

Distance of fourth jump = 18 − (4.3 + 4.6 + 5.2)

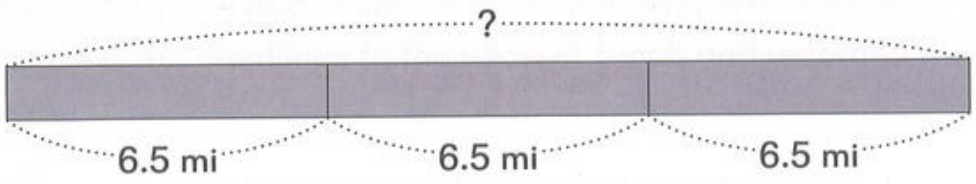
= 18 − 14.1

= 3.9

His fourth jump was _____ ft.

Do

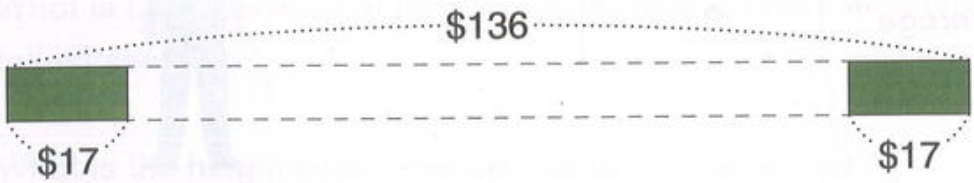
1 Emma walked a different distance each day for 3 days. The average distance she walked each day was 6.5 miles. What was the total distance she walked?





Average Distance × Number of Days
= Total Distance

2 The students in the math club spent a total of $136 to buy several different scientific calculators. The average cost for each calculator was $17. How many calculators did they buy?





Total Cost ÷ Average Cost
= Number of Calculators

3 Antonio drove 15 h 20 min total in 2 days. On average, how much time did he spend driving each day?



15 h ÷ 2
20 min ÷ 2

4 The average length of two ribbons is 32 cm. The length of one of the ribbons is 28 cm. What is the length of the other ribbon?



Total Length = 2 × ?

5 Sofia accidentally spilled grape juice on her math progress report. What was her score for Test B?

Test A	95
Test B	
Test C	87
Average	91

The total number of points is...



6 Jessie bought 4 shirts. The average cost of 3 of the shirts was $14.80. The fourth shirt cost $24. What was the average cost of all four shirts?

First, I need to find the total cost of all 4 shirts.

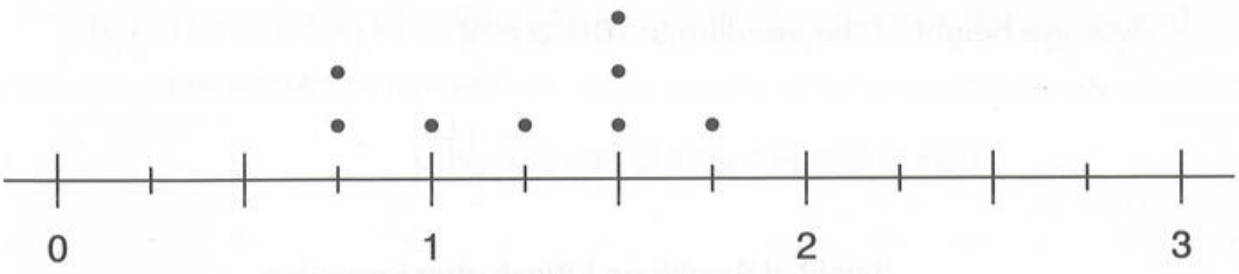


Exercise 2 • page 106

Think

Sofia planted some pea seeds. A week after they sprouted, she measured the height of the seedlings to the nearest $\frac{1}{4}$ inch and recorded the data in a line plot.

Height of Seedlings 1 Week after Sprouting

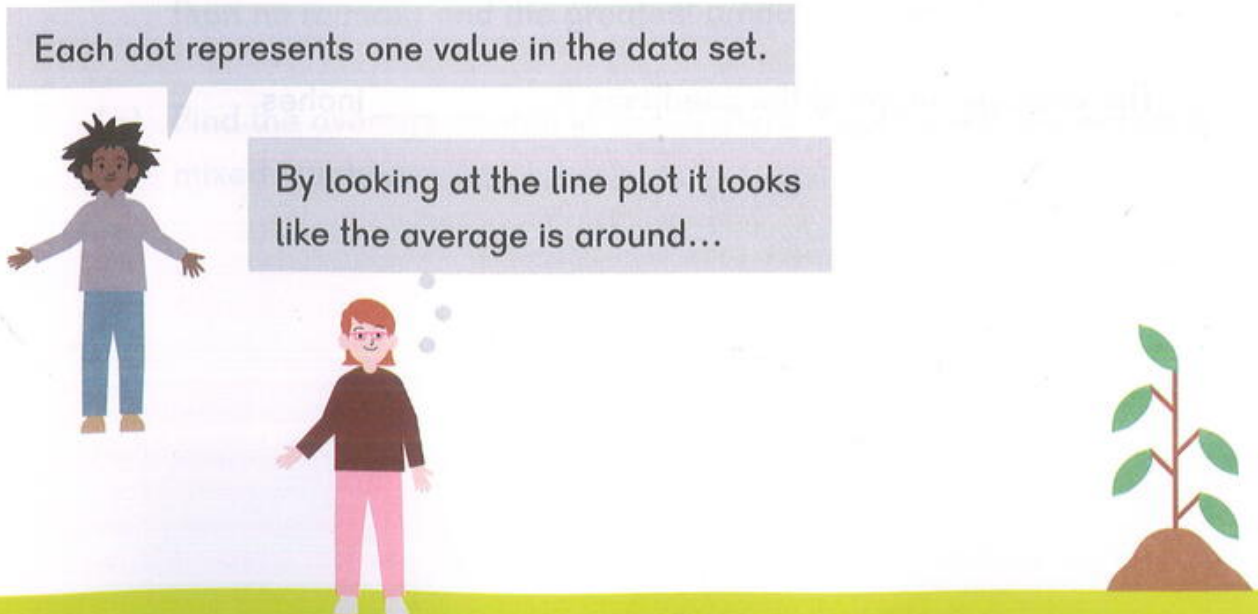


Height (inches)

(a) What is the difference in height between the shortest seedling and the tallest seedling?

(b) What is the height where most of the data is clustered?

(c) Find the average height of the seedlings.



Learn

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

The difference in height between the shortest and tallest seedling is _____ inch.

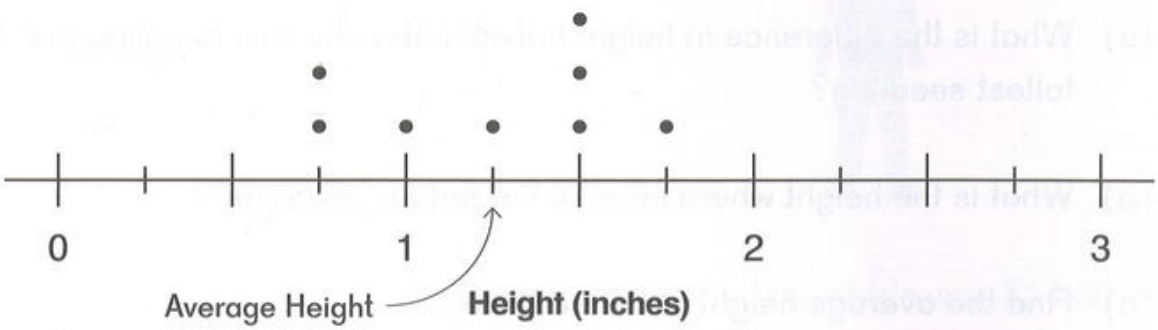
(b) Most of the data is clustered around $1\frac{1}{2}$ inches.

(c) $(2 \times \frac{3}{4}) + 1 + 1\frac{1}{4} + (3 \times 1\frac{1}{2}) + 1\frac{3}{4} = 10$

Average height of the seedlings: $10 \div 8 = \frac{10}{8}$

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

Height of Seedlings 1 Week after Sprouting



The average height of the seedlings is _____ inches.

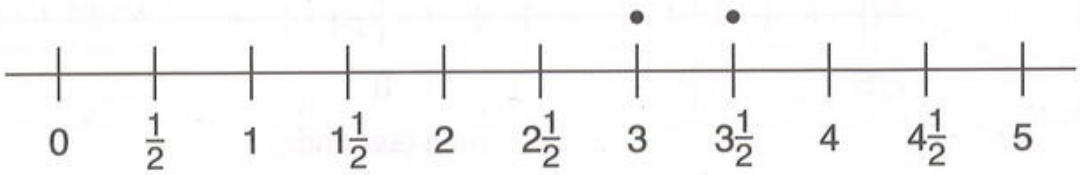
Do

1 The table shows the average rainfall in Mumbai, India over a two-week period in April to the nearest half of a centimeter.

Daily Rainfall (cm)						
3	$3\frac{1}{2}$	2	0	$1\frac{1}{2}$	$\frac{1}{2}$	$2\frac{1}{2}$
4	3	$\frac{1}{2}$	$2\frac{1}{2}$	$3\frac{1}{2}$	4	$4\frac{1}{2}$

(a) The first two values have been plotted on the line plot. Copy and complete the line plot.

Daily Rainfall During 2 Weeks in April



Daily Rainfall (cm)

(b) What is the difference between the least amount of rainfall (other than no rainfall) and the greatest amount of rainfall?

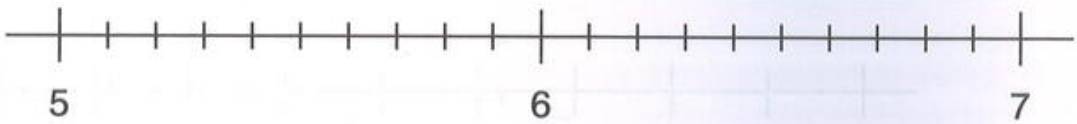
(c) Find the average rainfall in centimeters. Express the answer as a mixed number.

2 A car manufacturer wanted to find the amount of time it takes their new car model to go from 0 miles per hour to 60 miles per hour. They ran 10 trials. The results in seconds are shown in the table below.

Time (seconds)				
5.5	5.6	5.6	5.4	5.5
5.7	5.5	5.5	6.9	5.6

(a) Copy and complete the line plot.

Car Times from 0 mph to 60 mph



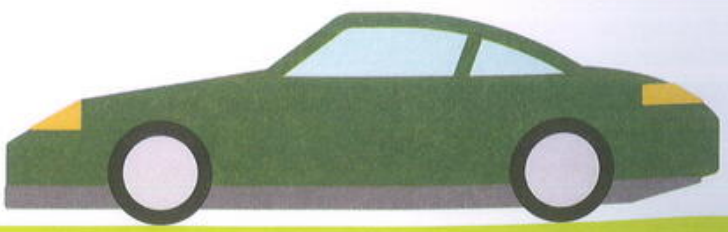
Time (seconds)

(b) What is the difference between the slowest time and the fastest time?

(c) Around what time were most of the times clustered?

(d) Find the average time, rounded to the first decimal place.

(e) What time is significantly different from the other times? How do you think this affected the average?



3 The table below shows the heights of 10 girls to the nearest inch at the beginning of third grade and at the beginning of fifth grade.

Name	Third Grade Height (in)	Fifth Grade Height (in)
Rosa	50	54
Jasmine	48	53
Ashley	52	55
Victoria	45	49
Priya	52	57
Sarah	49	53
Laila	51	56
Edith	47	51
Natalia	50	54
Jia	51	55

(a) Make two line plots, one for the heights in third grade and another for the heights in fifth grade.

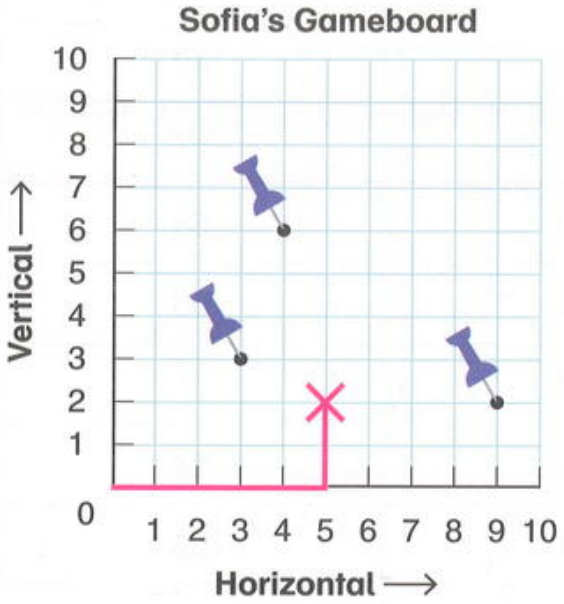
(b) By looking at the line plots, what height would you choose as a typical height for the girls in third grade? What height would you choose as a typical height for the girls in fifth grade?

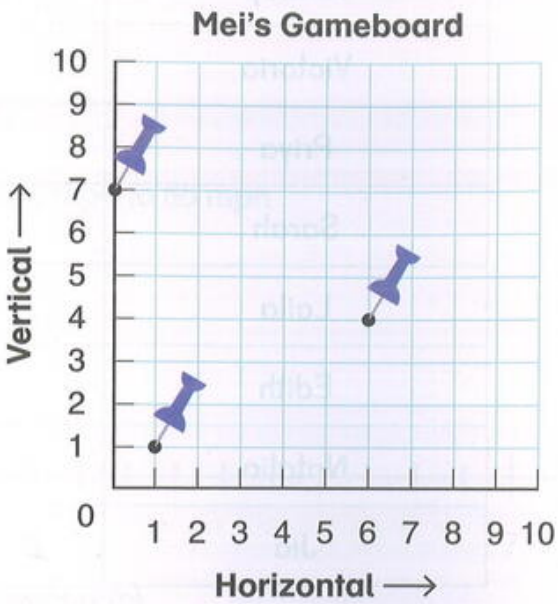
(c) By comparing the line plots, what was a typical increase in height for the girls from third grade to fifth grade?

Exercise 3 • page 110

Think

Sofia and Mei are playing a game. They hide their game boards from each other and place 3 pins on any point where the grid lines intersect. Then they take turns guessing the locations of the other player's pins by starting at 0 and moving horizontally and then vertically.





5 units in the horizontal direction and 2 units in the vertical direction.



Did Sofia get a hit or a miss?

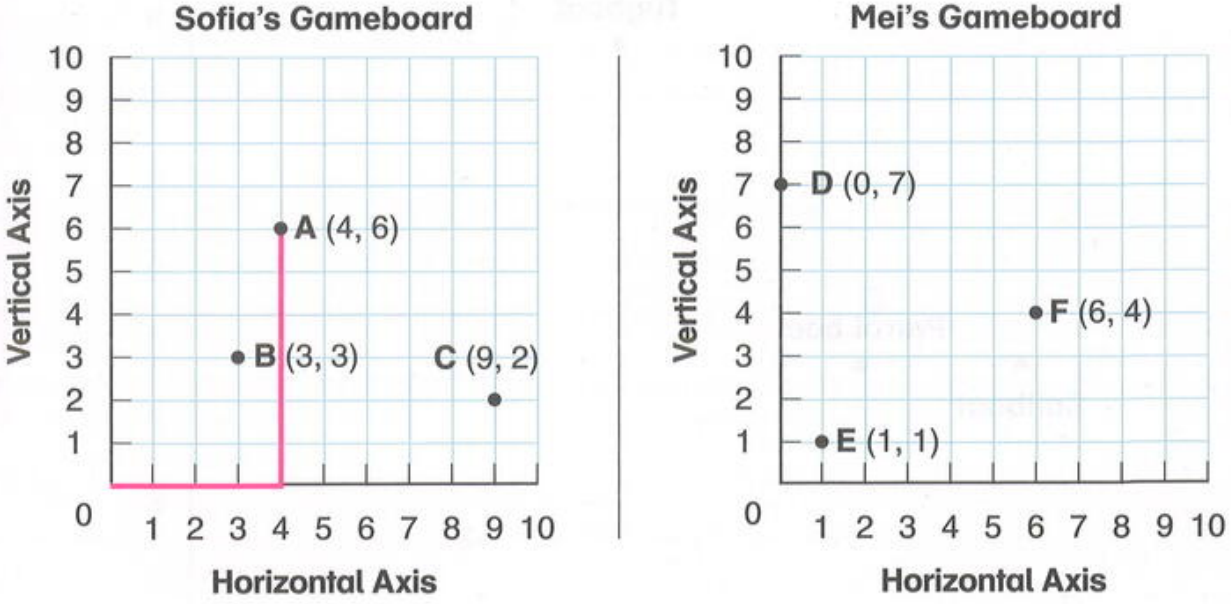
Miss! Now it's my turn. 6 units in the horizontal direction and 4 units in the vertical direction.



Using this method, name the locations of each player's pins.

Learn

We can express the location of a point in two-dimensional space using two number lines called **axes** on a **coordinate graph**. Points are named using a pair of numbers called **coordinates**.



The first coordinate tells how many units away from 0 the point is on the horizontal axis. The second coordinate tells how many units away from 0 the point is on the vertical axis.

The **origin** is the point where the two axes intersect, and has the coordinates (0, 0).



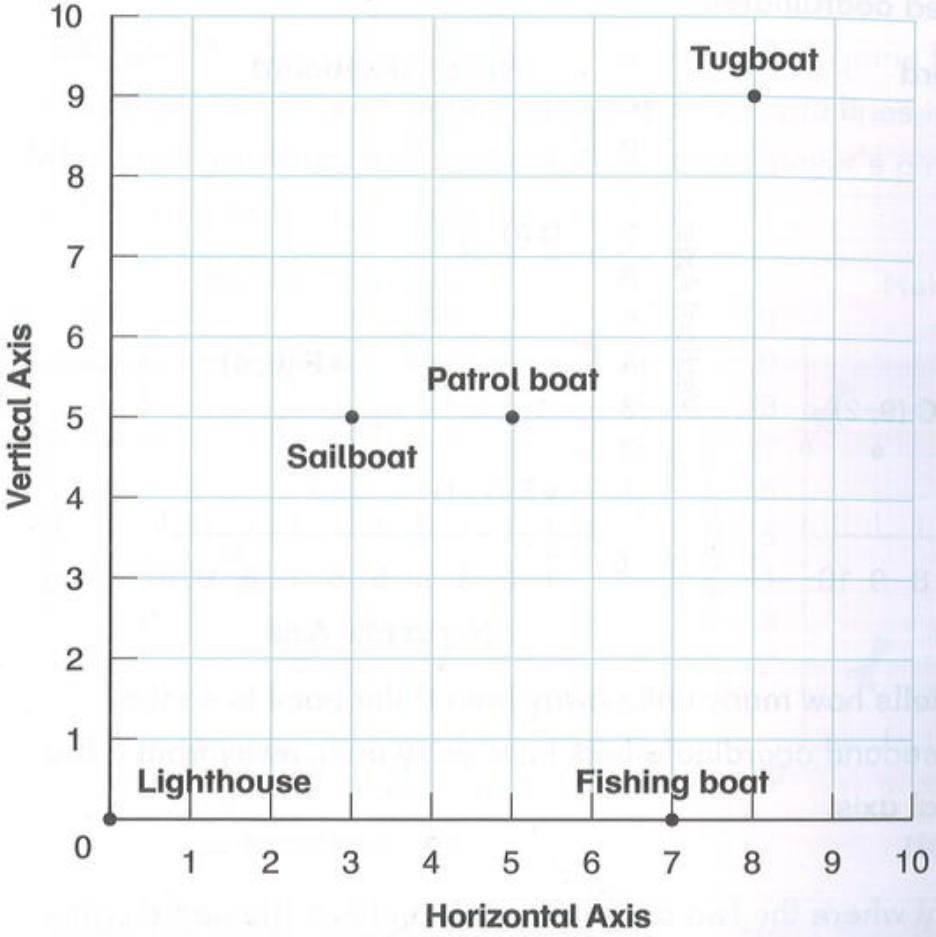
We can write the position of Point A as (4, 6). From the origin, it is located 4 units in the horizontal direction and 6 units in the vertical direction.

How are the locations of Points A and F different?



Do

1 The map shows the distance in nautical miles of different boats from the lighthouse.



Use coordinates to express the position of:

(a) The fishing boat

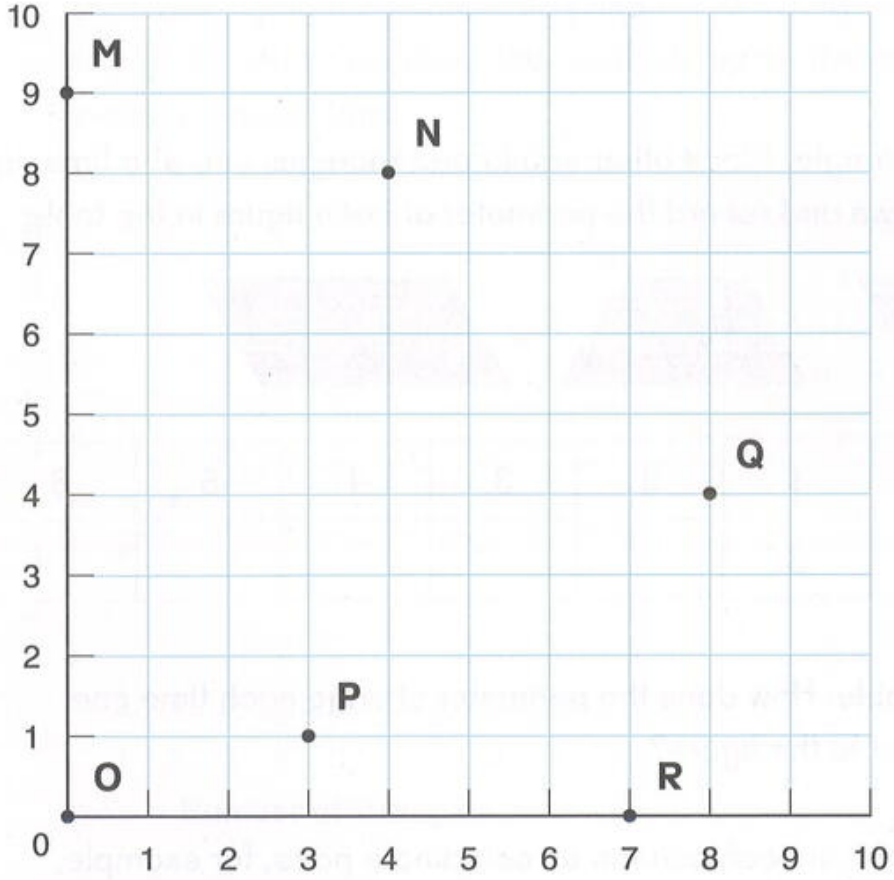
(b) The sailboat

(c) The tugboat

(d) The patrol boat



2 Which point corresponds to each set of coordinates?



(a) (3, 1) (b) (7, 0) (c) (0, 0)

(d) (8, 4) (e) (4, 8) (f) (0, 9)

3 Use 1-cm graph paper and a ruler to draw a coordinate graph. Then plot and label the following points: A (2, 2), B (2, 8), C (7, 8).

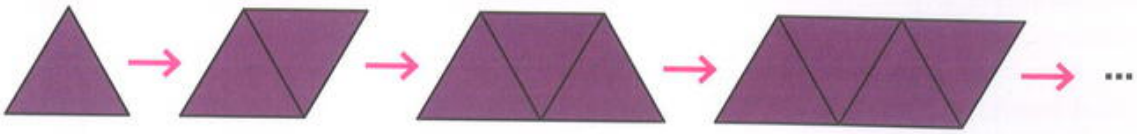
(a) Connect the points to make a triangle.

(b) Find the area of the triangle.

Exercise 4 • page 113

Think

Use an equilateral triangle. Place other equilateral triangles one at a time on the right side as shown and record the perimeter of each figure in the table.



Number of Triangles	1	2	3	4	5	6
Perimeter (units)	3					

(a) Complete the table. How does the perimeter change each time one triangle is added to the figure?

(b) Write the numbers in each column as coordinate pairs, for example, (1, 3). Then plot the points on a coordinate graph and connect the points with a line. What kind of line is it?

(c) What is the perimeter for 8 triangles?

Learn

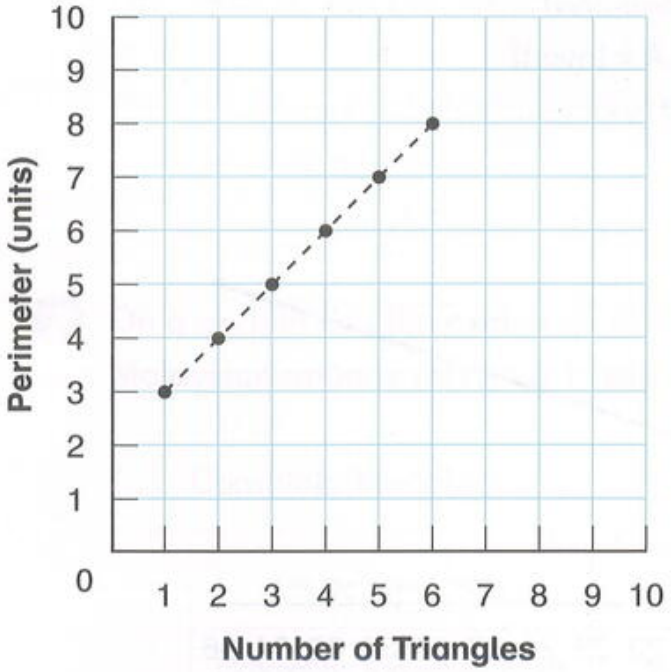
(a) Each time 1 triangle is added the perimeter increases by 1.

+1

Number of Triangles	1	2	3	4	5	6
Perimeter (units)	3	4	5	6	7	8

+1

(b) We can write the relationship between the number of triangles and the perimeter using the coordinate pairs (1, 3), (2, 4), (3, 5), (4, 6), (5, 7), and (6, 8). When we show this relationship on the coordinate graph it forms a straight line.



We can draw a line through the points to show the relationship between the coordinates, even though there are no data points between the whole numbers.



(c) Perimeter for 1 triangle $\longrightarrow 1 + 2 = 3$

Perimeter for 2 triangles $\longrightarrow 2 + 2 = 4$

Perimeter for 3 triangles $\longrightarrow 3 + 2 = 5$

Perimeter = Number of Triangles + 2



Perimeter for 8 triangles $\longrightarrow 8 + 2 = 10$

We can also find the perimeter for 8 triangles by extending the straight line on the graph.

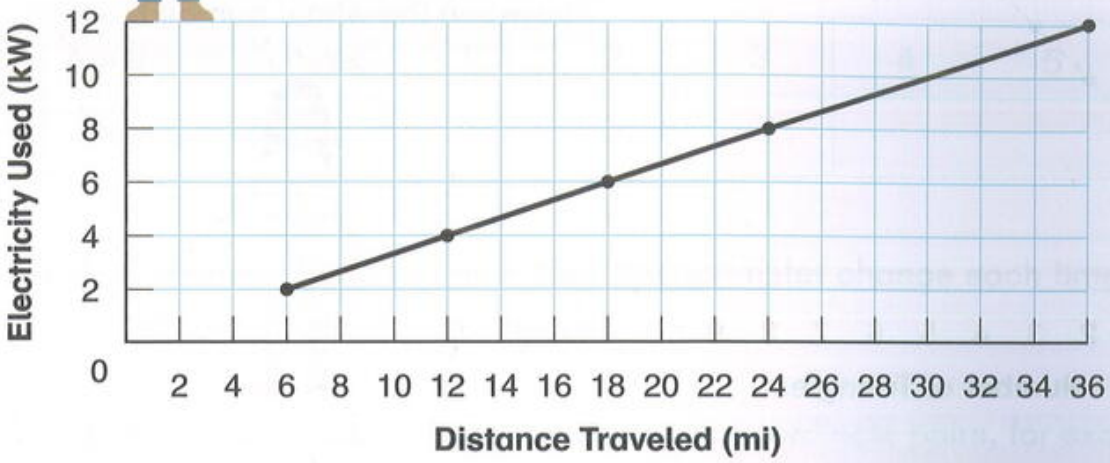


Do

1 The line graph shows the relationship between the amount of electricity used by an electric car in kilowatts and the distance the car travels in miles.



Electrical power is measured in units called **watts**. A kilowatt (kW) is equal to 1,000 watts.



(a) When the distance increases by 6 mi, the electricity used increases by _____ kW.

(b) Complete the table using the points in the graph.

Distance Traveled (mi)	6				
Electricity Used (kW)					

(c) What is the relationship between the number of miles and the number of kW?

(d) How much electricity will the car use if it travels 1 mile?

(e) How much electricity will the car use if it travels 7 miles?

(f) How far will the car travel if it uses 9 kilowatts of electricity?

(g) How far will the car travel if it uses 20 kilowatts of electricity?

(h) If 1 kilowatt of electricity costs 12 cents, how much does it cost to drive 30 miles?

2 On a certain day the exchange rate between US dollars (USD) and Malaysian ringgits (MYR) is 1 USD for 4 MYR.

(a) Complete the table.

US Dollars (USD)	2	4		8	
Malaysian Ringgits (MYR)	8		24		36

(b) Draw a line graph for this data. Label the horizontal-axis US dollars and the vertical-axis Malaysian ringgits.

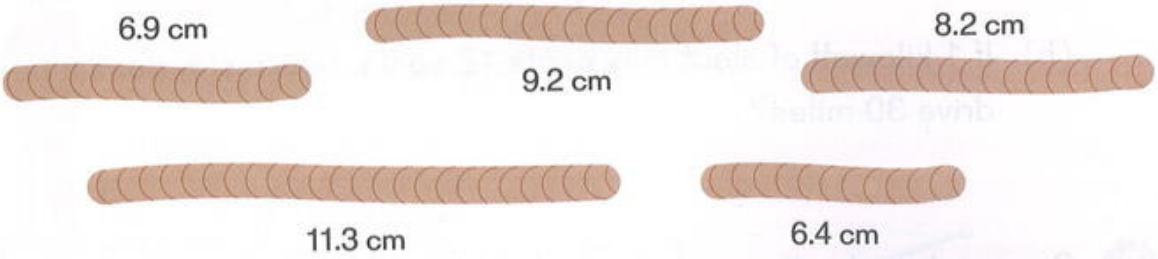
(c) How many MYR would someone get for exchanging 5 USD?

(d) How many USD would a person get for exchanging 44 MYR?

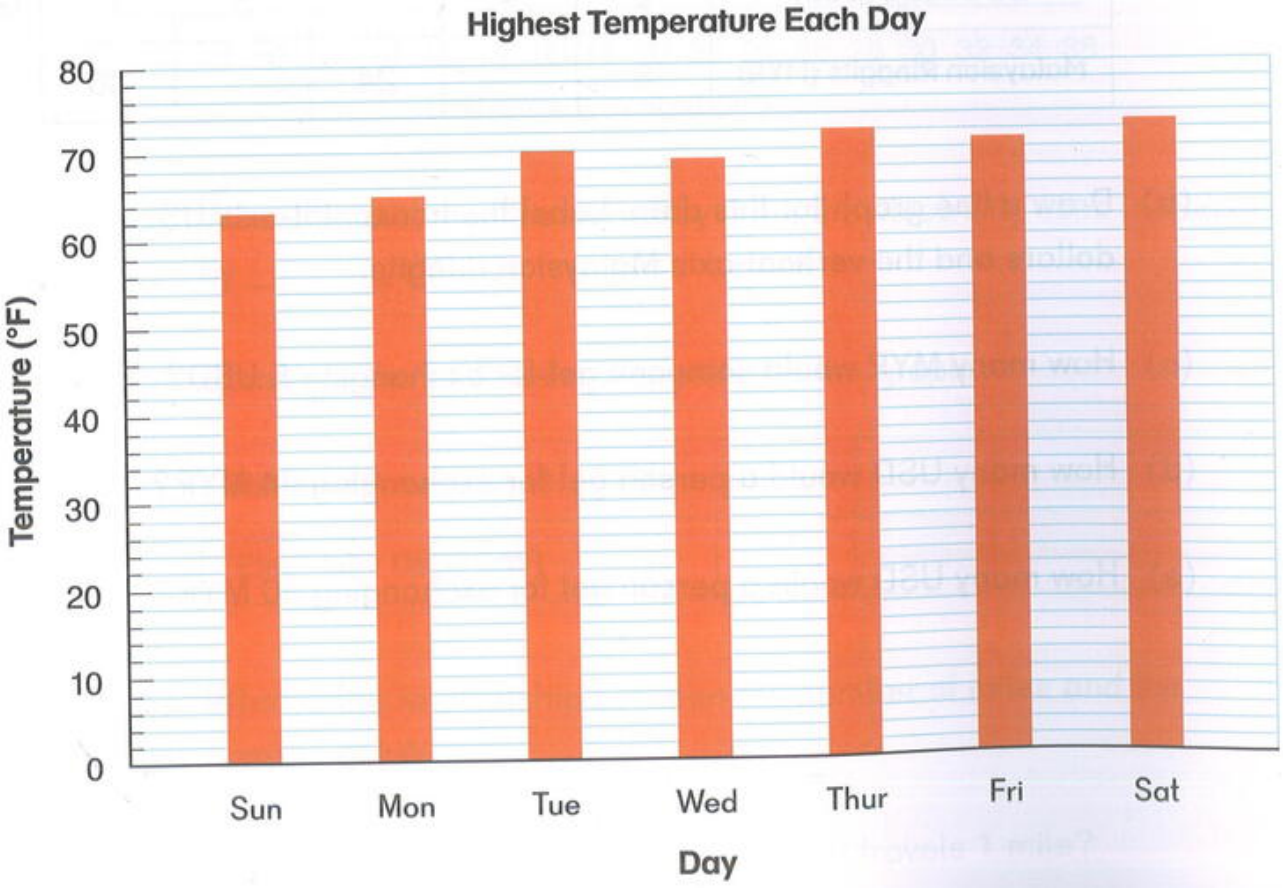
(e) How many USD would a person get for exchanging 50 MYR?

Exercise 5 • page 116

1 What is the average length of the earthworms?



2 Emma recorded the highest temperature to a whole number of degrees each day for a week in her town and displayed the data in a bar graph. What was the average high temperature for the week?



3 In a carton of 12 large eggs, the average weight of an egg is 52 g. What is the total weight of the eggs?

4 The average weight of 2 packages is 2.7 lb. The average weight of 3 packages is 1.4 lb. What is the average weight of all 5 packages? Round your answer to the first decimal place.

5 The average height of 4 girls is 1 m 48 cm. A fifth girl is 1 m 53 cm tall. What is the average height of the 5 girls?

6 Jenna weighed 10 marbles and recorded their weights to the nearest 0.5 g in a table.

Marble Weights (grams)				
5.0	4.5	6.0	5.5	4.5
4.0	3.5	4.5	5.0	3.5

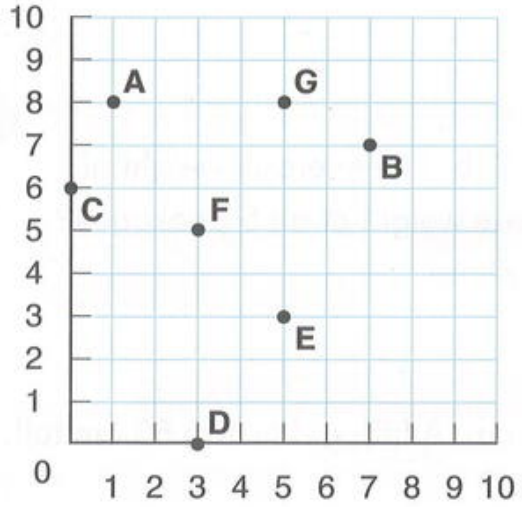
(a) Make a line plot and plot the data from the table.

(b) What is the difference between the weights of the lightest and the heaviest marbles?

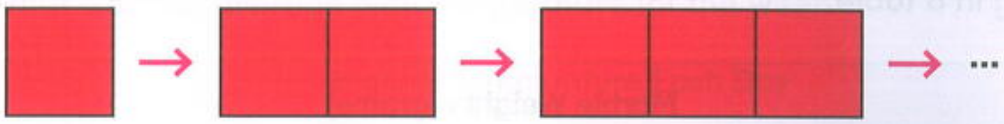
(c) Around what value is most of the data clustered?

(d) In this data set, what is the average weight of a marble?

7 What are the coordinates of each point on the graph below?



8 1-inch square tiles are placed together as shown.



(a) How does the perimeter change each time one square is added to the figure?

(b) Write 5 coordinate pairs (number of squares, perimeter) for 1, 2, 3, 4, and 5 squares. Use the coordinate pairs to draw a line graph.

(c) What is the perimeter for 25 squares?

9 The average height of 5 children is 1 m 28 cm. The average height of all 5 children along with 2 more children, Amy and Brianna, is 1 m 30 cm. Brianna is 16 cm shorter than Amy. How tall is Brianna?

Exercise 6 • page 120

1 Find the values

(a) $45 \div 5 \times 3$

(b) $45 \div (5 \times 3)$

(c) $(500 - 80) \div 4$

(d) $500 - 80 \div 4$

(e) $(36 - 15 \div 5 \times 2) - 15 \div 3 - 5$

(f) $(3{,}000 + 8{,}000) \times 90 \div (1{,}400 - 500)$

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

(a) $2\frac{1}{6} - \frac{5}{8}$

(b) $5\frac{1}{3} - (\frac{2}{3} \times \frac{5}{6})$

(c) $6 \div \frac{3}{8}$

(d) $\frac{3}{8} \div 6$

(e) $(4\frac{1}{3} \times 1\frac{1}{2}) - (\frac{1}{3} \times 1\frac{1}{2})$

(f) $(1\frac{1}{2} - \frac{2}{3}) \times (4 \times 2\frac{1}{2})$

3 Find the values. Express each answer as a decimal.

(a) $(7 \times 0.001) + (3 \times 0.1)$

(b) $\frac{300}{1{,}000} + \frac{6}{100} + 3 \times \frac{3}{10}$

(c) $5.6 \div 700$

(d) 8.2×7.8

(e) 3.8×0.29

(f) $0.3 - 0.2 \div 5$

(g) $0.64 \div 4 \times 8.9$

(h) $0.08 \div \frac{1}{40}$

4 Find the equivalent measures.

(a) 340 cm = ____ m

(b) 20 L 60 mL = ____ L

(c) 1.8 kg = ____ g

(d) 500 cm = ____ km

5 Divide. Express the quotients correct to the second decimal place.

(a) $70 \div 3$

(b) $64 \div 0.6$

(c) $11.1 \div 7$

(d) $112 \div 3.2$

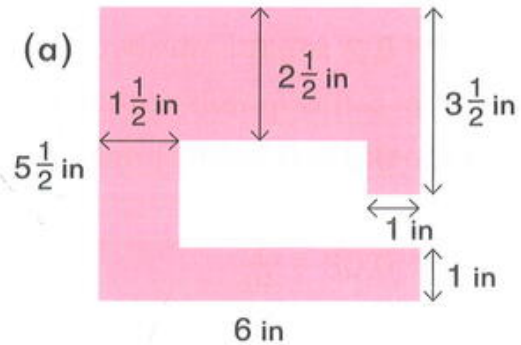
6 Order the numbers from least to greatest.

(a) $1.08, 0.154, \frac{1}{8}, 0.12, \frac{43}{250}, \frac{9}{5}$

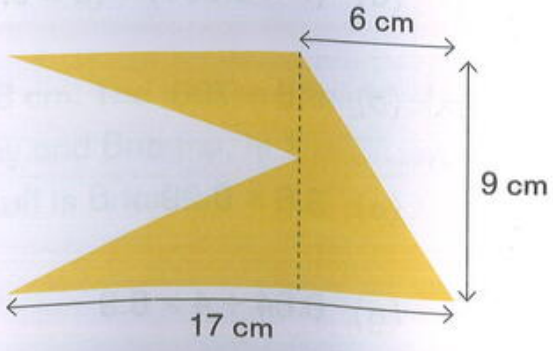
(b) $\frac{4}{9}, 0.45, \frac{3}{11}, \frac{27}{1{,}000}, 0.54$

7 Find the area of each figure.

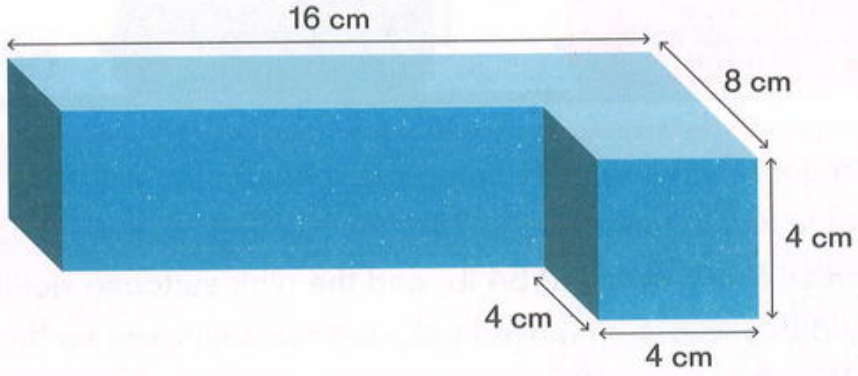
(a)



(b)



8 Find the volume of the solid figure.



9 Use graph paper and a ruler to draw a coordinate graph with 10 units for each axis. Then plot and label the following points: A (0, 4), B (7, 3), C (9, 7), and D (2, 8). Draw a straight line from A to B, B to C, C to D, and D to A. What figure did you draw?

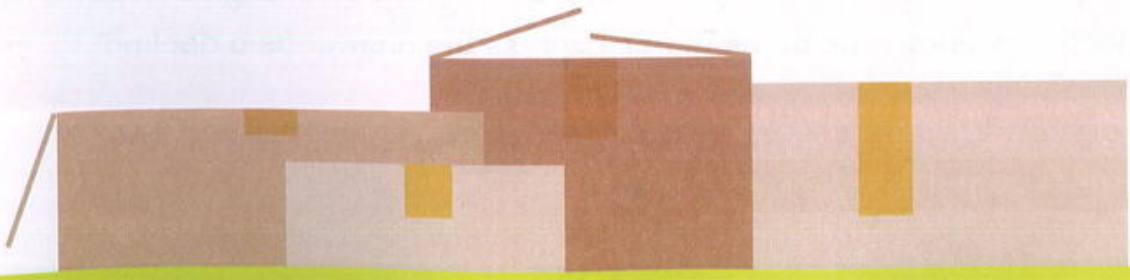
10 A rectangle with a length of 3 cm and a width of 1 cm has an area of 3 cm^2.

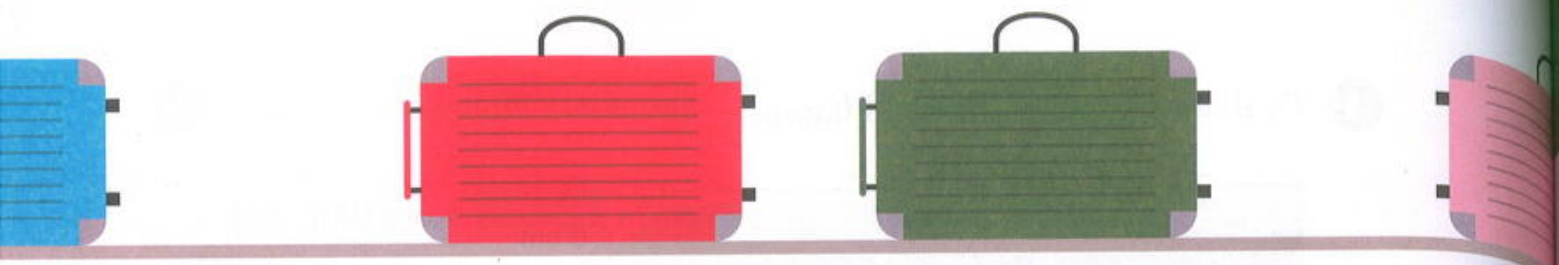
(a) Draw a line graph to show how the area changes when the width changes to 2 cm, 3 cm, 4 cm, and 5 cm. Make the horizontal axis the width, and the vertical axis the area.

(b) What will be the coordinates of the point for an area of 48 cm^2?

(c) If the line is extended, will it go to the origin?

11 Four packages weigh 1 kg 800 g, 2 kg 60 g, 1 kg 4 g, and 2 kg 504 g. What is their average weight in kilograms and grams?

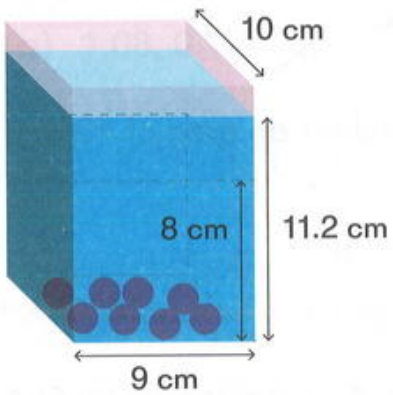




12 A blue, a red, a green, and a pink suitcase were each packed and weighed. The blue suitcase weighed 47 lb, the red suitcase weighed 56 lb, the green suitcase weighed 54 lb, and the pink suitcase weighed 39 lb. How could the weight be moved between the suitcases so that they all weigh the same?

13 Nicole has test scores of 83, 85, 92, 96, and 82. What must the average score on the next three tests be so that the average score on all eight tests is at least 90?

14 A rectangular container has a length of 10.0 cm, a width of 9.0 cm, and is filled with water to a height of 8.0 cm. After 8 identical marbles were put in, the height rose to 11.2 cm. What is the volume of one marble?



15 Two ropes, A and B, were the same length at first. After cutting $2\frac{1}{2}$ m from Rope A and $1\frac{2}{5}$ m from Rope B, Rope B is $1\frac{1}{2}$ times as long as Rope A. How long was each rope at the start? Express the answer as a decimal.

Exercise 7 • page 123

Chapter 13

Ratio

Dion's father is looking up recipes for their neighborhood party.

Lemon Tea

–Lemonade
–Unsweetened iced tea

Mix 4 cups of lemonade with 6 cups of unsweetened iced tea. Pour over crushed ice and serve.

Teriyaki Sauce

–1 c soy sauce
–1 c water
–$\frac{1}{2}$ c brown sugar

Mix all the ingredients together and simmer until slightly thickened.

Brown Rice

–2 c brown rice
–4 c water
–1 tsp salt

Boil the water in a pot. Add the salt and rice to the pot. Cover and cook on low heat for 25 minutes.

Chicken Teriyaki

–3 lb boneless, skinless chicken thighs
–2 c teriyaki sauce (see Teriyaki Sauce recipe)

Bake chicken at 350 degrees for 30 minutes. Pour teriyaki sauce over chicken. Lower heat to 300 degrees and cook for 15 more minutes.

I wonder if this will make enough food for the party.



If we have to make more than what the recipe calls for, how can we know how much of each ingredient to use?



Lesson 1
Finding the Ratio

1

Think

Alex and Mei are making salad dressing.

We each want to make 9 Tbsp of dressing.



Salad Dressing

Mix 2 Tbsp olive oil with 1 Tbsp red wine vinegar.

Add salt and pepper to taste.

Alex mixes 2 Tbsp of oil and 1 Tbsp of vinegar. He continues to add 2 Tbsp of oil and 1 Tbsp of vinegar successively until he has 9 Tbsp of dressing.

Mei mixes 2 Tbsp of oil and 1 Tbsp of vinegar. She continues to add 1 Tbsp of oil and 1 Tbsp of vinegar successively until she has 9 Tbsp of dressing.

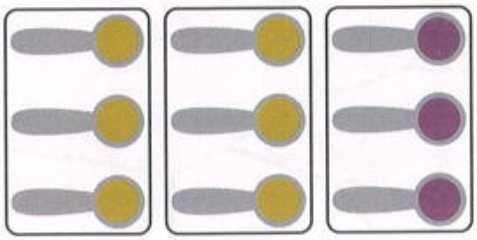
Whose dressing will taste the same as the original recipe?

We both made 9 Tbsp of dressing but they don't taste the same.

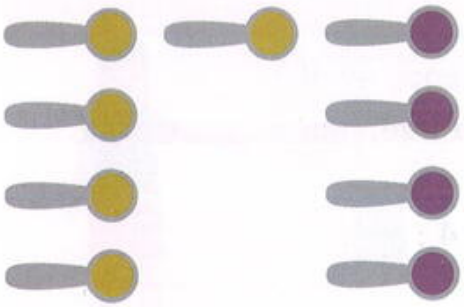


Learn

Alex's dressing



Mei's dressing



There are 2 units of oil for every 1 unit of vinegar. The taste is the same as the original recipe.



There are not 2 units of oil for every 1 unit of vinegar. The taste is not the same as the original recipe.

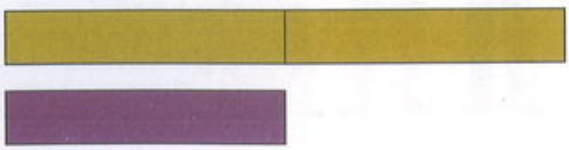


Alex's dressing tastes the same because, like the original recipe, there are 2 units of oil for every 1 unit of vinegar. We say that the **ratio** of oil to vinegar is 2 to 1, and we write it as 2 : 1.

2 and 1 are the **terms** of the ratio.

Oil

Vinegar



There is 2 times as much oil as vinegar, and $\frac{1}{2}$ as much vinegar as oil.



The ratio of oil to vinegar is 2 : 1.

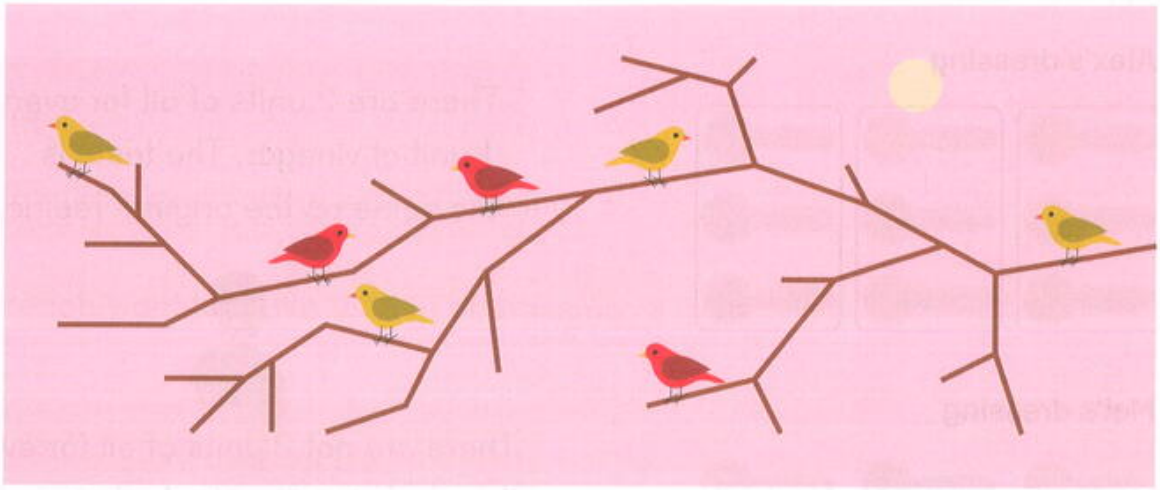
The ratio of vinegar to oil is 1 : 2.

What is the ratio of the oil to the total liquid?



Do

1



There are 4 yellow birds and 3 red birds in a tree.

(a) The ratio of yellow birds to red birds is 4 : ☐.

(b) The ratio of red birds to yellow birds is ☐ : 4.

2



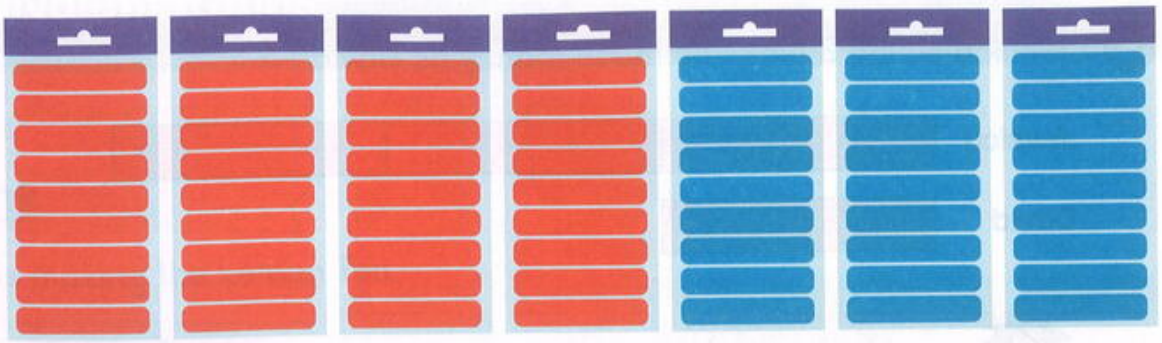
On a class field trip there is 1 adult chaperone for every 5 children.

(a) The ratio of adults to children is ☐ : ☐.

(b) The ratio of children to adults is ☐ : ☐.

(c) The ratio of children to the total people is ☐ : ☐.

3

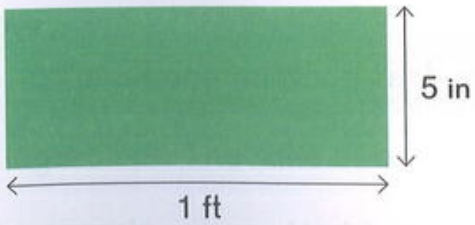


Emma bought 4 packs of orange clay and 3 packs of blue clay. What is the ratio of orange clay to blue clay?



If we consider each pack of clay as 1 unit, the ratio is...

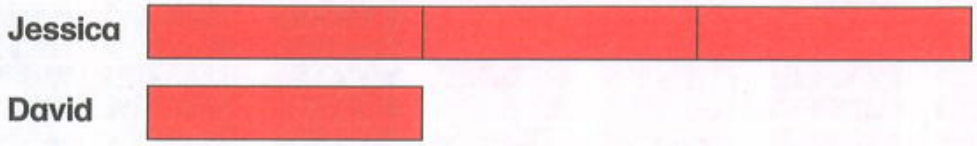
4 The width of a strip of paper is 5 inches and the length of the paper is 1 foot. What is the ratio of the width to the length of the paper?





To compare measurements using a ratio, the terms need to be expressed in the same unit of measurement.
1 ft = ? in

5 Jessica saved 3 times as much money as David.





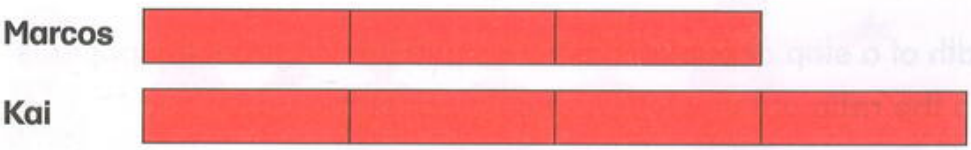
How many units of money does each person have?

(a) What is the ratio of Jessica's savings to David's savings?

(b) What is the ratio of David's savings to Jessica's savings?

(c) What is the ratio of David's savings to the total savings?

6 Marcos has $\frac{3}{4}$ as many marbles as Kai.





How many units of marbles does each person have?

(a) What is the ratio of Marcos's marbles to Kai's marbles?

(b) What is the ratio of Kai's marbles to Marcos's marbles?

(c) What is the ratio of Kai's marbles to the total marbles?

Exercise 1 • page 133

Lesson 2
Equivalent Ratios

2

Think

Mei is making the Lemon Tea.

Lemon Tea

–Lemonade
–Unsweetened iced tea

Mix 4 cups of lemonade with 6 cups of unsweetened iced tea. Pour over crushed ice and serve.

Makes 10 one-cup servings.

What will be the ratio of cups of lemonade to cups of iced tea for each mixture?

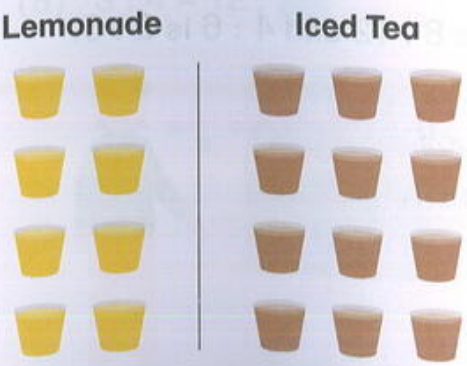


(a) How can she make 20 servings of this recipe?

(b) How can she make 5 servings of this recipe?

Learn

(a) To make 20 servings she needs to double the amount of each ingredient. The ratio of lemonade to iced tea will be 8 : 12.

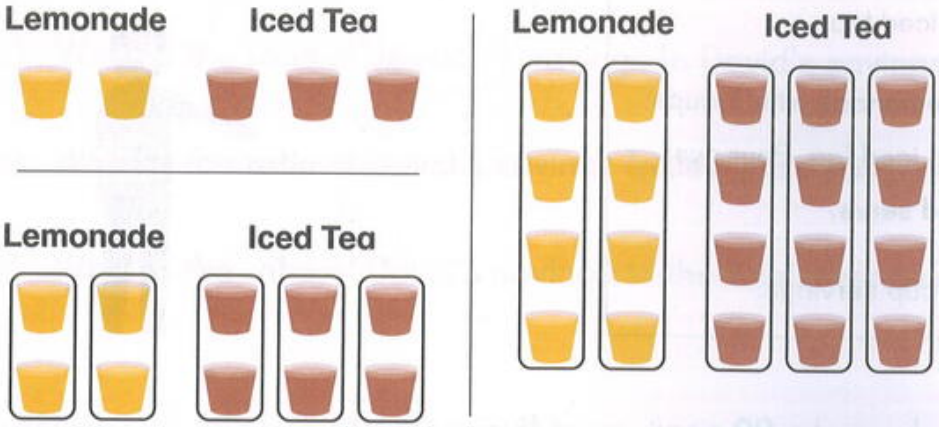


$$4 : 6$$
$$\times 2 \downarrow \quad \downarrow \times 2$$
$$= 8 : 12$$

(b) To make 5 servings she needs to halve the amount of each ingredient. The ratio of lemonade to iced tea will be 2 : 3.



2 : 3, 4 : 6, and 8 : 12 are **equivalent ratios.**





In each ratio there are 2 units of lemonade for every 3 units of iced tea.

To make equivalent ratios, multiply or divide both terms by the same number. The simplest form of the ratios 8 : 12 and 4 : 6 is 2 : 3.

A ratio is in its simplest form when each term has no common factor other than 1.



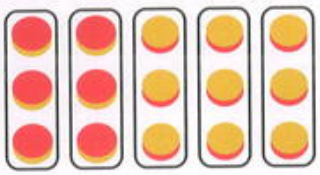
Do

1 Use 6 red and 9 yellow counters.



(a) What is the ratio of the total number of red counters to the total number of yellow counters?

(b) Make groups of 3. Each group should have the same color counters.





6 : 9
÷3 ↓ ↓ ÷3
= ? : ?

What is the ratio of groups of red counters to groups of yellow counters?

(c) What is the simplest form of the ratio 6 : 9?

2 Find the equivalent ratios.

(a) 3 : 4 = 12 : ☐



3 : 4
×4 ↓ ↓ ×4
= 12 : ?

(b) 12 : 16 = ☐ : 8



12 : 16
÷2 ↓ ↓ ÷2
= ? : 8

3 Express the ratio 20 : 16 in simplest form.

20 : 16 = ☐ : ☐

20 : 16
÷4 ↓ ↓ ÷4
= ? : ?



4 Express the ratio 56 : 42 in simplest form.

56 : 42 = ☐ : ☐



56 : 42
÷2 ↓ ↓ ÷2
= 28 : 21
÷7 ↓ ↓ ÷7
= ? : ?

5 Find the missing terms.

(a) 1 : 3 = ☐ : 21

(b) 3 : ☐ = 18 : 24

(c) 5 : 2 = 15 : ☐

(d) ☐ : 5 = 36 : 45

6 Write each ratio in simplest form.

(a) 10 : 5

(b) 40 : 8

(c) 9 : 12

(d) 24 : 36

Exercise 2 • page 137

Lesson 3
Finding a Quantity

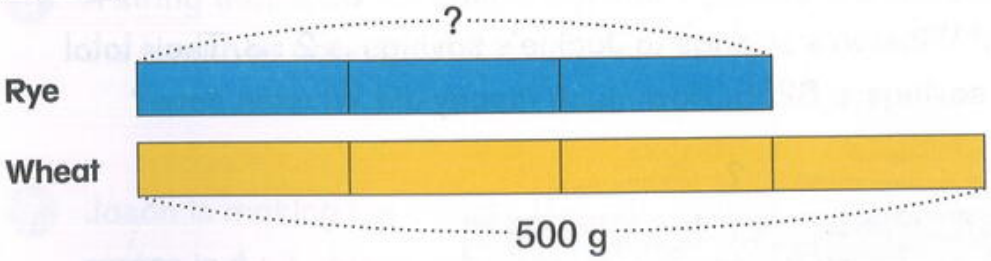
3

Think



The ratio of rye flour to wheat flour in a bread recipe is 3 : 4. Olga wants to make a loaf of bread with 500 grams of wheat flour. How many grams of rye flour does she need?

Learn



4 units ⟶ 500 g

1 unit ⟶ 500 ÷ 4 = 125 g

3 units ⟶ 125 × 3 = 375 g

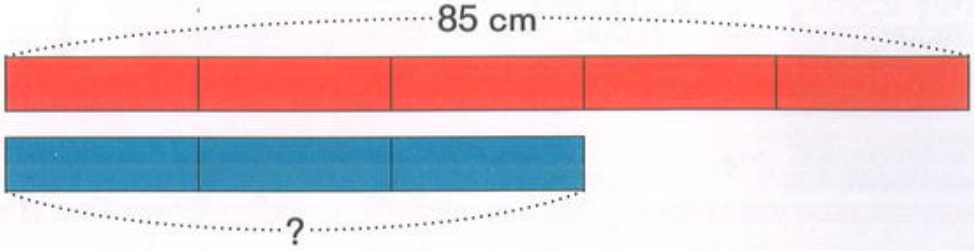
She needs _____ grams of wheat flour.

Do

1



The ratio of the length of a red ribbon to the length of a blue ribbon is 5 : 3. The red ribbon is 85 cm long. How long is the blue ribbon?

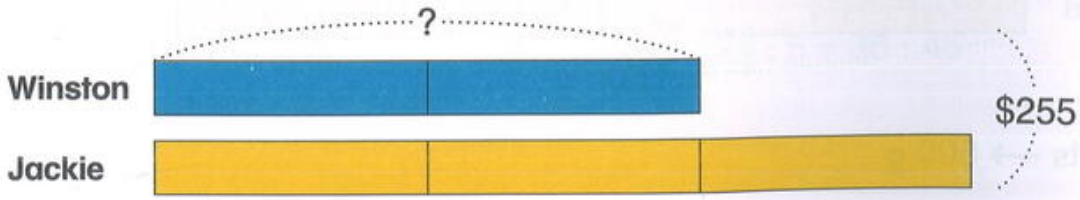


5 units ⟶ 85 cm

1 unit ⟶ 85 ÷ 5 = ☐ cm

3 units ⟶ 3 × ☐ = ☐ cm

2 The ratio of Winston's savings to Jackie's savings is 2 : 3. Their total combined savings is $255. How much money did Winston save?

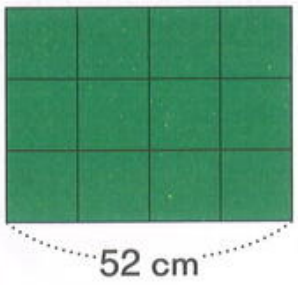


5 units ⟶ $255

1 unit ⟶ $☐

2 units ⟶ $☐

3 The ratio of the length to the width of a rectangle is 4 : 3. The length of the rectangle is 52 cm. What is the area of the rectangle?



4 The ratio of the volume of water in a pitcher to the volume of water in a bottle is 3 : 1. The pitcher contains 825 mL. How many milliliters of water are in the bottle?

5 Eliza and Abigail are sharing 56 sports cards in a ratio of 3 : 5. How many cards will each person get?

6 A string that is 98 cm long is cut into 2 pieces in a ratio of 4 : 3. What is the length of each piece?

7 Jason is making ice cream. The ratio of heavy cream to whole milk in the recipe is 4 : 1. Jason wants to use 2 quarts of milk. How many gallons of heavy cream will he need?



1 gal = 4 qt

Exercise 3 • page 140

Lesson 4
Comparing Three Quantities

4

Think

Alex is using the following recipe to make fruit punch.

Super Fruit Punch

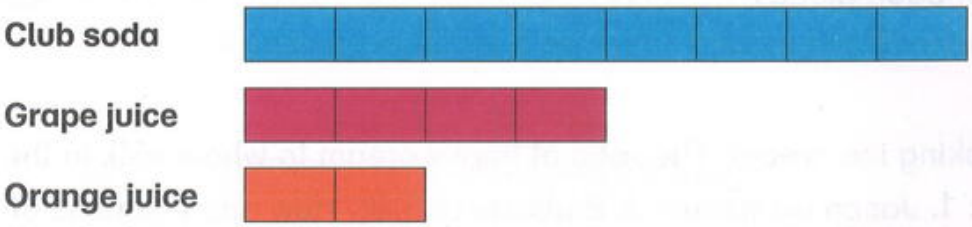
–8 c club soda
–4 c grape juice
–2 c orange juice

Mix all the ingredients together and pour over ice.

He only has 1 cup of orange juice. How much club soda and grape juice should he use?

Learn

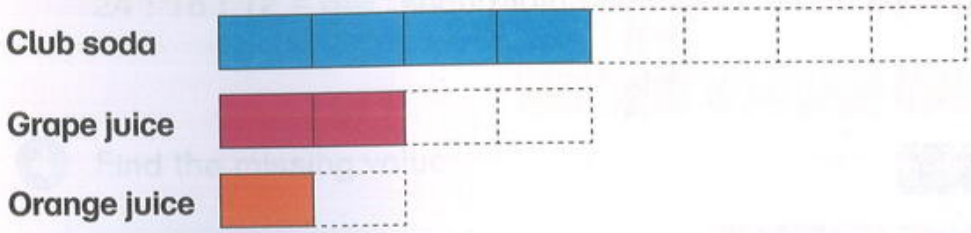
The ratio of club soda to grape juice to orange juice can be expressed as 8 : 4 : 2. We read the ratio 8 : 4 : 2 as **8 to 4 to 2.**





Alex has only 1 cup of orange juice and the recipe calls for 2 cups. 1 cup is half of 2 cups. If we divide the amount of each ingredient by 2 we will make half the amount of punch as the original recipe.





Alex should use _____ cups of club soda and _____ cups of grape juice.

8 : 4 : 2
÷2 ÷2 ÷2
4 : 2 : 1

2 is a common factor of 8, 4, and 2.



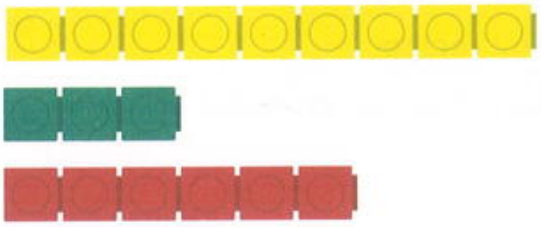
The simplest form of the ratio 8 : 4 : 2 is 4 : 2 : 1.

4, 2, and 1 do not have a common factor other than 1.



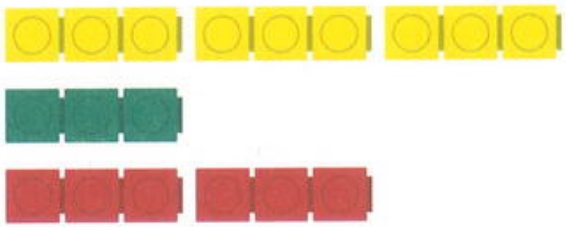
Do

1 Use cubes of three different colors as shown.



(a) What is the ratio of the total number of yellow cubes to the total number of green cubes to the total number of red cubes?

(b) Make groups of 3 of the same color cubes.



What is the ratio of groups of yellow cubes to groups of green cubes to groups of red cubes?

(c) What is the simplest form of the ratio 9 : 3 : 6?

2 Find the missing values.

4 : 5 : 6 = 8 : ☐ : ☐

$$\begin{array}{ccccc} 4 & : & 5 & : & 6 \\ \downarrow \times 2 & & \downarrow \times 2 & & \downarrow \times 2 \\ = 8 & : & ? & : & ? \end{array}$$



3 Write the ratio 24 : 18 : 12 in simplest form.



$$24 : 18 : 12 \xrightarrow{\div 2} = 12 : 9 : 6 \xrightarrow{\div 3} = ? : ? : ?$$

$$24 : 18 : 12 \xrightarrow{\div 6} = ? : ? : ?$$



2, 3, and 6 are common factors of 24, 18, and 12.



24 : 18 : 12 = ☐ : ☐ : ☐

4 Find the missing values.

(a) 3 : 2 : 4 = ☐ : ☐ : 20

(b) 9 : 6 : 3 = 3 : ☐ : ☐

(c) 16 : 8 : 12 = ☐ : 2 : ☐

5 Write each ratio in simplest form.

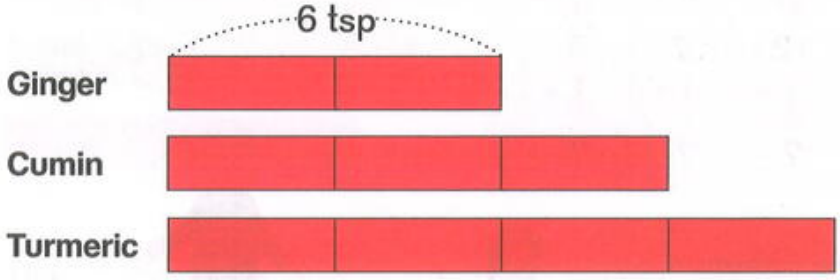
(a) 4 : 6 : 12

(b) 35 : 25 : 15

(c) 36 : 18 : 12

(d) 14 : 21 : 42

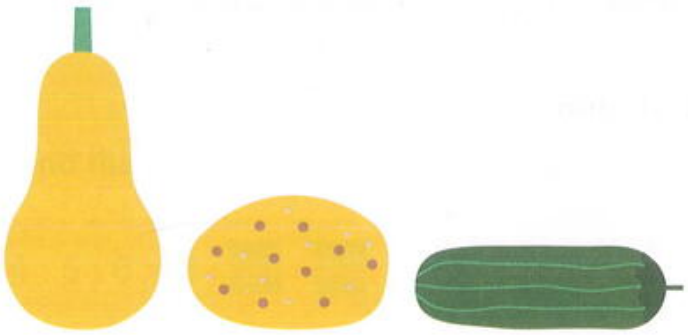
6 The ratio of ginger to cumin to turmeric in a curry mix is 2 : 3 : 4. If we use 6 teaspoons of ginger how many teaspoons of each of the other spices do we need?





$$2 : 3 : 4$$
$$\downarrow \times ? \quad \downarrow \times ? \quad \downarrow \times ?$$
$$= 6 : ? : ?$$

7 A winter squash weighs 2 lb. A potato weighs 10 oz. A cucumber weighs 12 oz. What is the ratio of the weight of the winter squash to the weight of the potato to the weight of the cucumber?



The units have to be the same.
1 lb = 16 oz

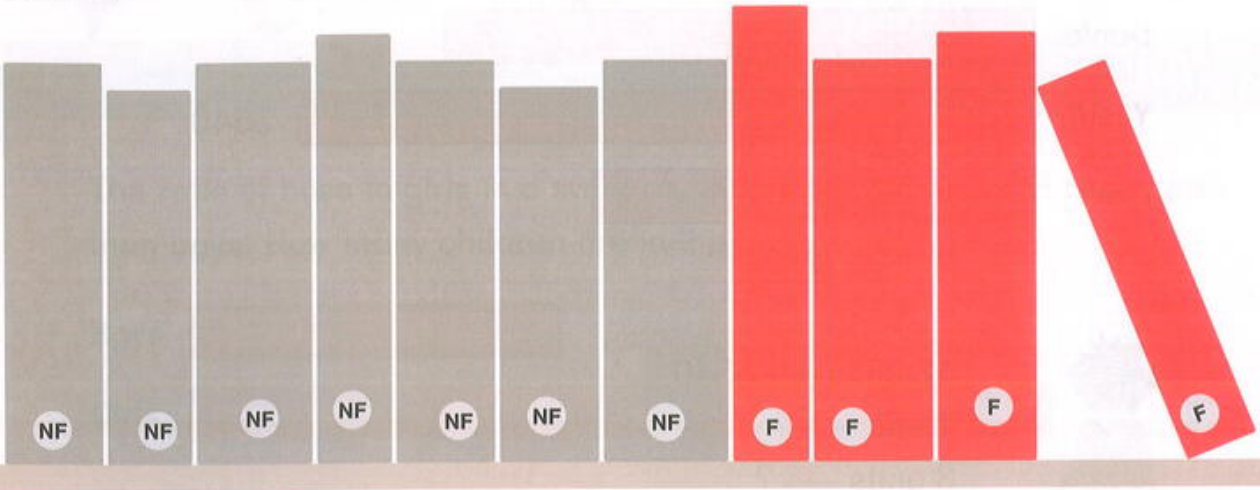


Exercise 4 • page 143

Lesson 5
Word Problems

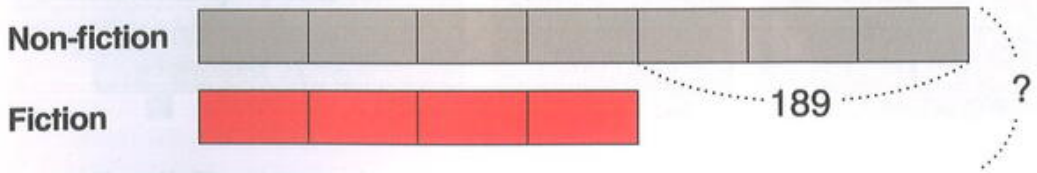
5

Think



A bookstore sells fiction books and non-fiction books. The ratio of non-fiction books to fiction books is 7 : 4. There are 189 more non-fiction books than fiction books. How many books are there altogether?

Learn



3 units ⟶ 189

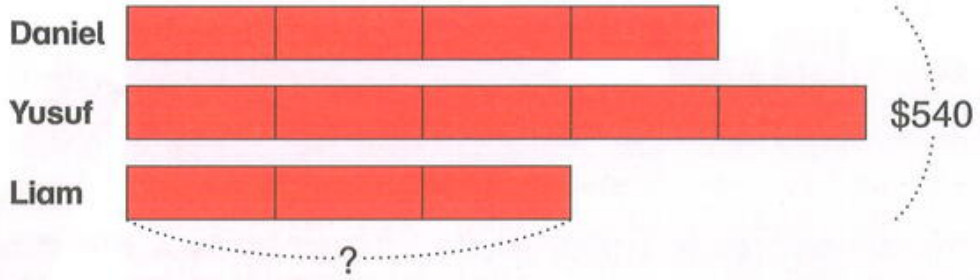
1 unit ⟶ 189 ÷ 3 = 63

11 units ⟶ 11 × 63 = 693

There are _____ books altogether.

Do

1 The ratio of Daniel's to Yusuf's to Liam's savings is 4 : 5 : 3. Their total savings is $540. How much money did Liam save?



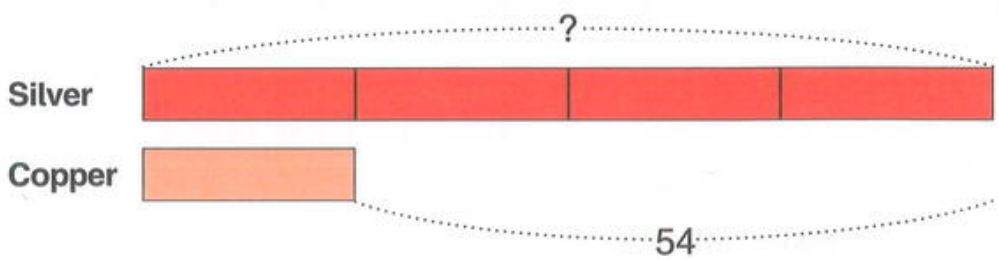


12 units ⟶ $540
1 unit ⟶ ?
3 units ⟶ ?

2



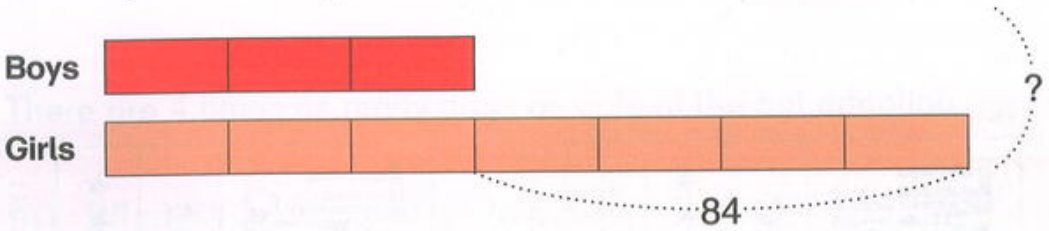
The ratio of silver-colored coins to copper-colored coins in Esther's coin collection is 4 : 1. There are 54 fewer copper-colored coins than silver-colored coins. How many silver-colored coins are in her collection?



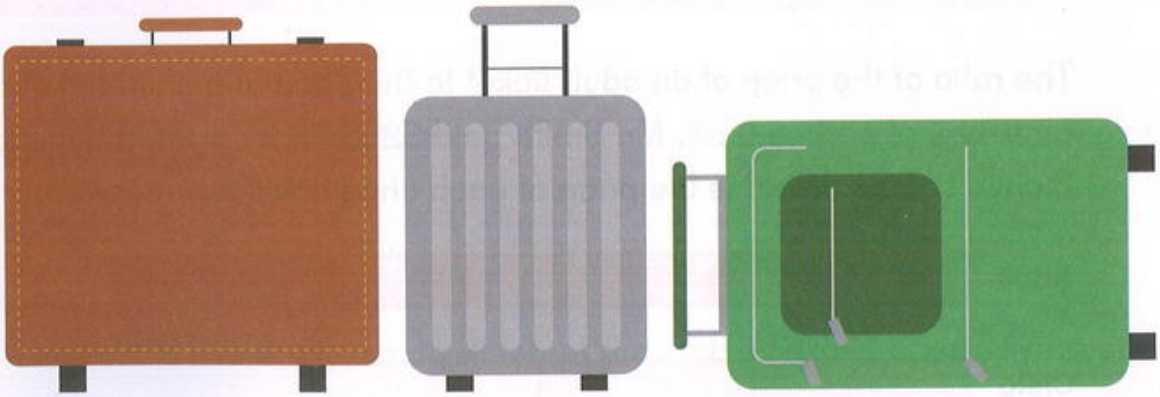
3



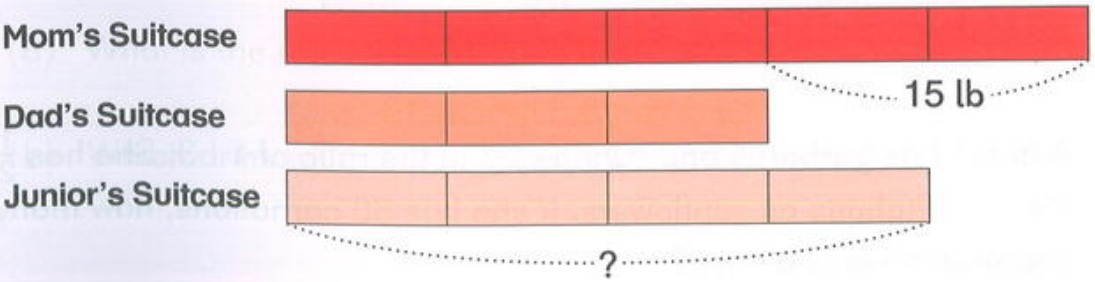
The ratio of boys to girls in a swim club is 3 : 7. There are 84 more girls than boys. How many children are in the swim club?



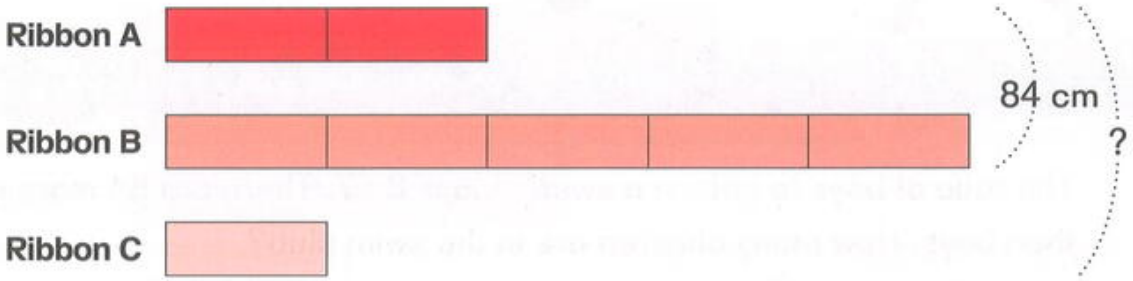
4



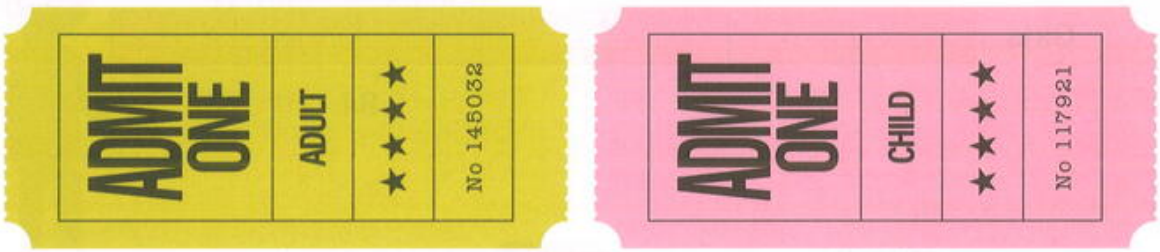
The ratio of the weights of Mom's packed suitcase to Dad's packed suitcase to Junior's packed suitcase is 5 : 3 : 4. Mom's suitcase weighs 15 lb more than Dad's suitcase. How much does Junior's suitcase weigh?



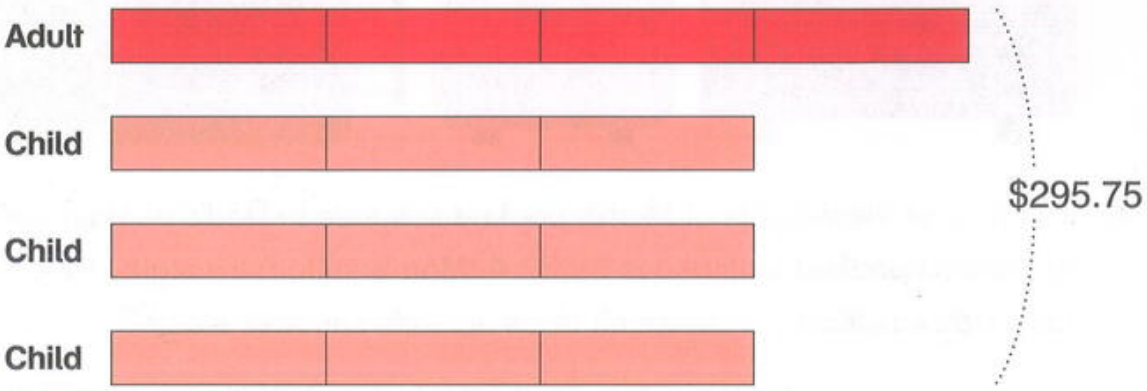
5 The ratio of the lengths of Ribbon A to Ribbon B to Ribbon C is 2 : 5 : 1. Ribbons A and B are 84 cm long altogether. What is the total combined length of the three ribbons?



6



The ratio of the price of an adult ticket to the price of a child ticket at an amusement park is 4 : 3. Mr. Smith paid $295.75 for 1 adult ticket and 3 child tickets. What is the price of each child ticket?



7 A florist has gerberas and sunflowers in the ratio of 1 : 3. She has $\frac{1}{2}$ as many carnations as sunflowers. If she has 60 carnations, how many gerberas does she have?

Exercise 5 • page 146

1. A pencil case has 5 regular pencils and 3 colored pencils.

   (a) What is the ratio of regular pencils to colored pencils?

   (b) What is the ratio of colored pencils to the total pencils?

2. There are 4 times as many dogs as cats at the pet adoption agency.

   (a) What is the ratio of dogs to cats?

   (b) What is the ratio of cats to dogs?

3. There are $\frac{2}{3}$ as many adults as children at a concert. What is the ratio of children to adults?

4. Alex mixed two drinks using different amounts of sweet cherry syrup and water.

   Drink A has 3 cups of syrup and 5 cups of water. Drink B has 7 cups of syrup and 10 cups of water.

   (a) What is the ratio of syrup to water in each drink?

   (b) Which drink will be sweeter and why?

5 Express each ratio in simplest form.

(a) 18 : 24

(b) 20 : 15

(c) 6 : 21

(d) 24 : 56

(e) 96 : 64 : 48

(f) 100 : 250 : 750

6 The ratio of sand to cement in a concrete mixture is 2 : 3. If there is 45 lb of cement, how much sand is needed?

7 To make sticky rice for 4 people requires 2 cups of sticky rice and 3 cups of water. Boris wants to make enough sticky rice for 12 people. How much sticky rice and water should he use?

8 Tara bought 10 oz of red peppers and 2 lb of green peppers. What is the ratio of red peppers to green peppers? Express the answer in simplest form.

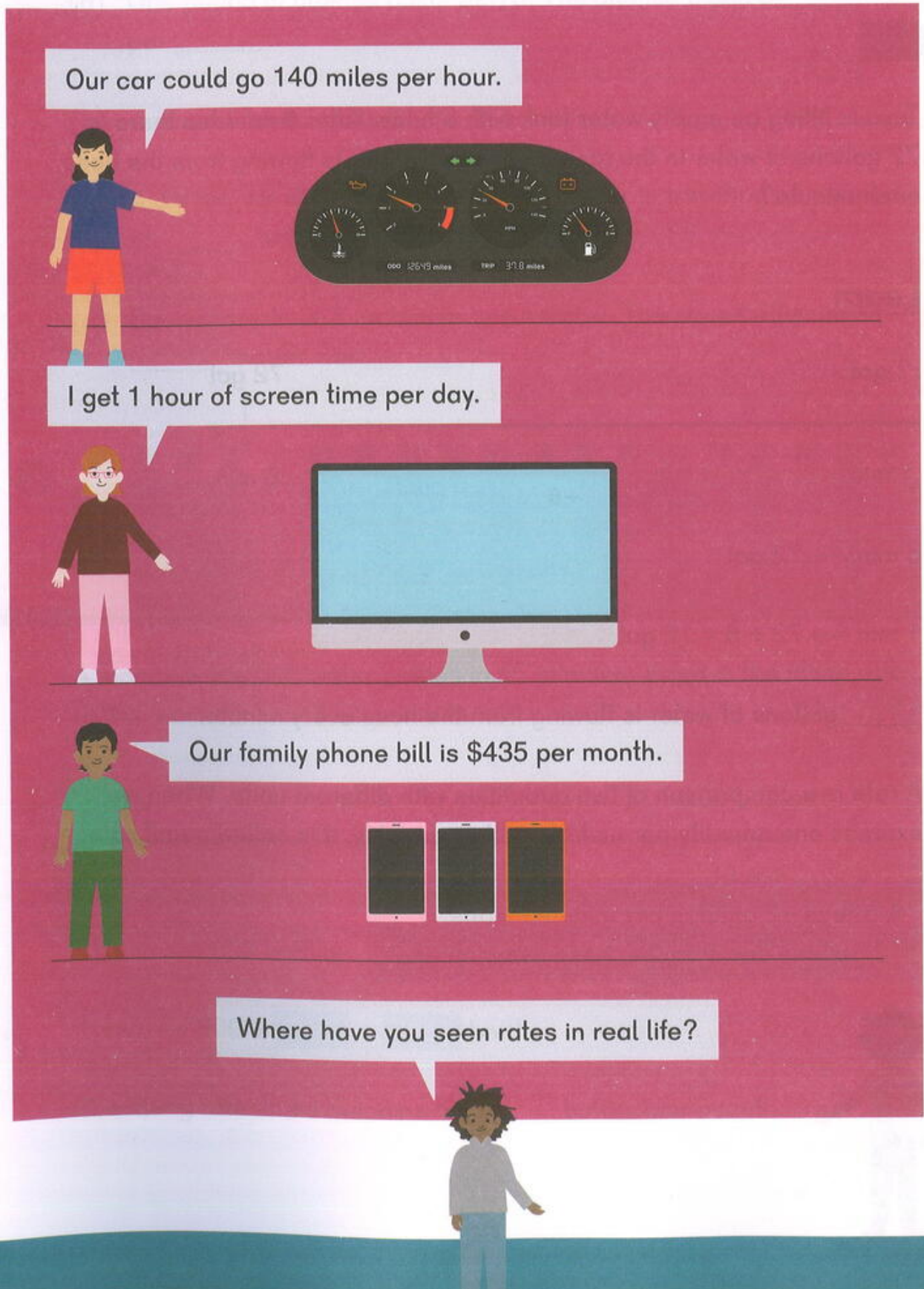
9 The ratio of Rodrigo's money to Sam's money to Cody's money is 4 : 3 : 6. Cody has $55.80 more than Rodrigo. How much money do they have altogether?

10 A beaker has 735 mL of Solution A and 350 mL of Solution B. How many more milliliters of Solution B need to be added so that the ratio of Solution A to Solution B is 3 : 4?

Exercise 6 • page 150

Chapter 14

Rate



Lesson 1
Finding the Rate

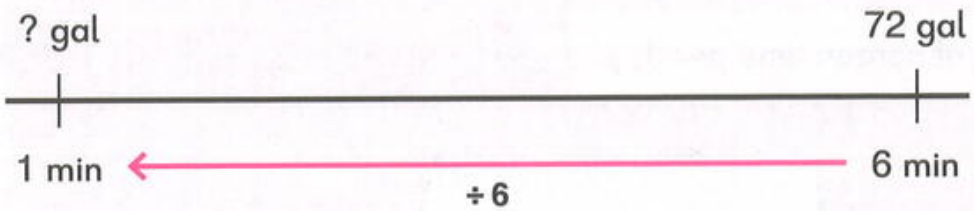
1

Think



Teya is filling an empty water tank with a hose. After 6 minutes there is 72 gallons of water in the tank. How much water is flowing from the hose each minute?

Learn



6 min ⟶ 72 gal

1 min ⟶ 72 ÷ 6 = 12 gal

_____ gallons of water is flowing from the hose every minute.

A **rate** is a comparison of two quantities with different units. When we express one quantity per unit of another quantity, it is called a **unit rate.**

A rate of 12 gallons **per** minute means 12 gallons flow from the hose every minute.



Do

1 Express the following as unit rates.

(a) One pound of cheese costs $2.75. The cheese costs $_____ per _____.

(b) A yard of fabric costs $1.99. The fabric costs $_____ per _____.

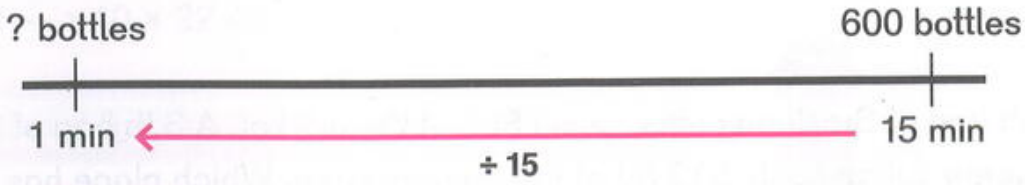
(c) A car travels 50 miles in one hour. The car is traveling at a speed of _____ miles per _____.

(d) Sound travels 343 meters in one second. The speed of sound is _____ meters per _____.

2



A machine fills 600 water bottles in 15 minutes. What is the filling rate of the machine in bottles per minute?



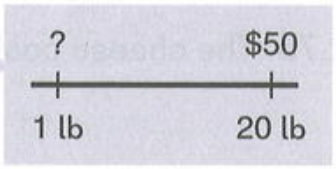
15 min ⟶ 600 bottles

1 min ⟶ 600 ÷ ☐ = ☐ bottles

The filling rate of the machine is _____ bottles per minute.

3 At a market, 20 pounds of honeycrisp apples costs $50. What is the price per pound of the apples?





20 lb ⟶ $50

1 lb ⟶ 50 ÷ ☐ = $ ☐

The apples cost $_____ per pound.



A price for a product given as a rate per 1 unit of measure, such as dollars per pound, is called the **unit price**.

4 On a trip to Australia, Mr. Phelps exchanged 500 US dollars for 750 Australian dollars. What was the exchange rate for 1 US dollar?

5 A 5 lb bag of Brazilian coffee costs $32 at the market. A 3 lb bag of the same coffee costs $19.50 at the grocery store. Which place has a lower unit price for the coffee?

How much does 1 lb of coffee cost at each place?



Exercise 1 • page 155

Lesson 2
Rate Problems — Part 1

2

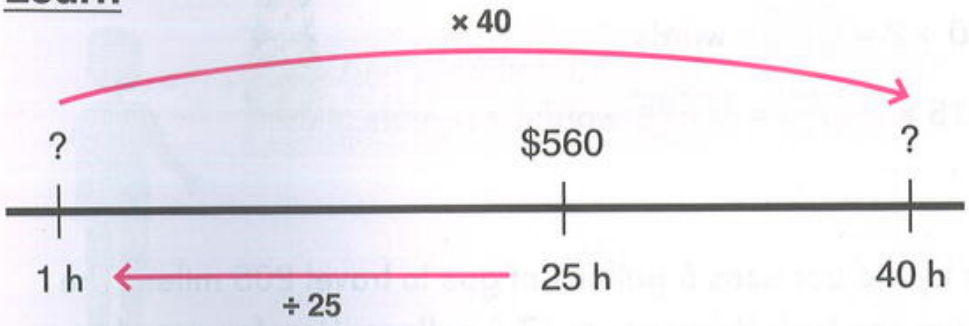
Think

Jessica worked for 25 hours one week and was paid $560. At this rate, how much would she earn for working 40 hours?



What is her hourly rate of pay?

Learn



25 h ⟶ $560

1 h ⟶ $\frac{560}{25}$ = $22.40

40 h ⟶ 40 × 22.40 = $896

I found the amount for 40 hours this way:

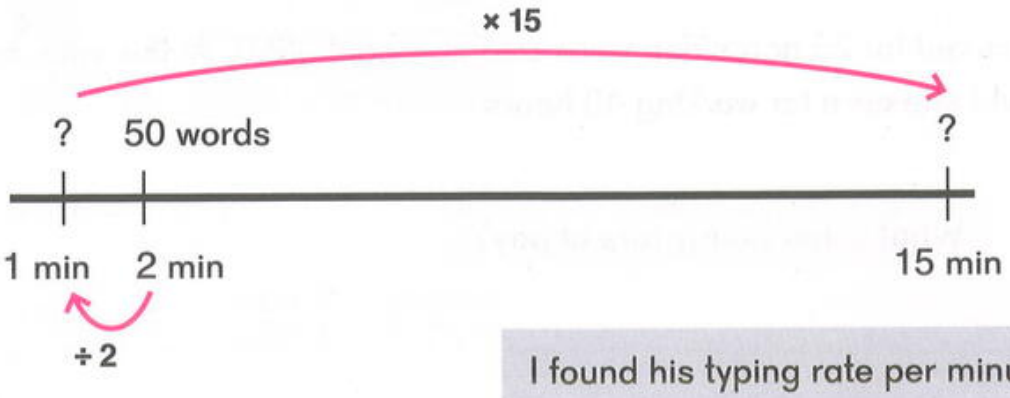


40 h ⟶ $\overset{8}{\cancel{40}} \times \frac{560}{\underset{5}{\cancel{25}}} = 8 \times \frac{\overset{112}{\cancel{560}}}{\underset{1}{\cancel{5}}} = 896$

She would earn $_____.

Do

1 Dion can type 50 words in 2 minutes. At this rate, how many words can he type in 15 minutes?



I found his typing rate per minute first.

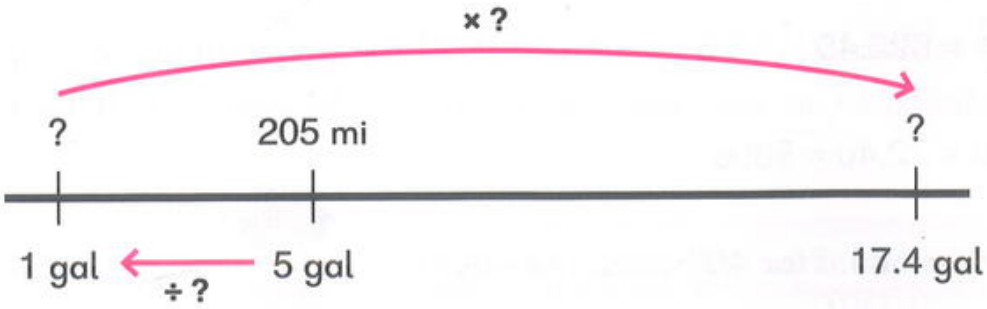


2 min ⟶ 50 words

1 min ⟶ 50 ÷ 2 = ☐ words

15 min ⟶ 15 × ☐ = ☐ words

2 Mrs. Chen's hybrid car uses 5 gallons of gas to travel 205 miles. The capacity of the gas tank in her car is 17.4 gallons. How far can she travel on a full tank of gas?



5 gal ⟶ 205 mi

1 gal ⟶ 205 ÷ 5 = ☐ mi

17.4 gal ⟶ 17.4 × ☐ = ☐ mi

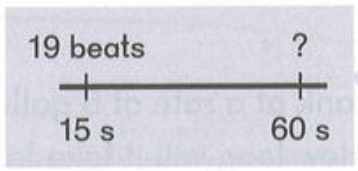


3 Gavin's heart beats 19 times in 15 seconds. How many times does it beat in 1 minute?

$15 \text{ s} \longrightarrow 19 \text{ beats}$

$1 \text{ s} \longrightarrow \frac{19}{15} \text{ beats}$

$1 \text{ min} \longrightarrow 60 \times \frac{19}{15} = \square \text{ beats}$



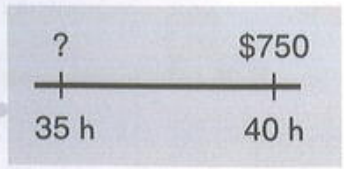


4 A machine stamps 420 bottle caps in 1 minute. How many bottle caps can it stamp in 40 seconds?



How many bottle caps can it stamp in 1 second?

5 Last week Mary worked 40 hours at the pet store and was paid $750. This week she worked 35 hours. If she is paid at the same rate, how much will she get paid?







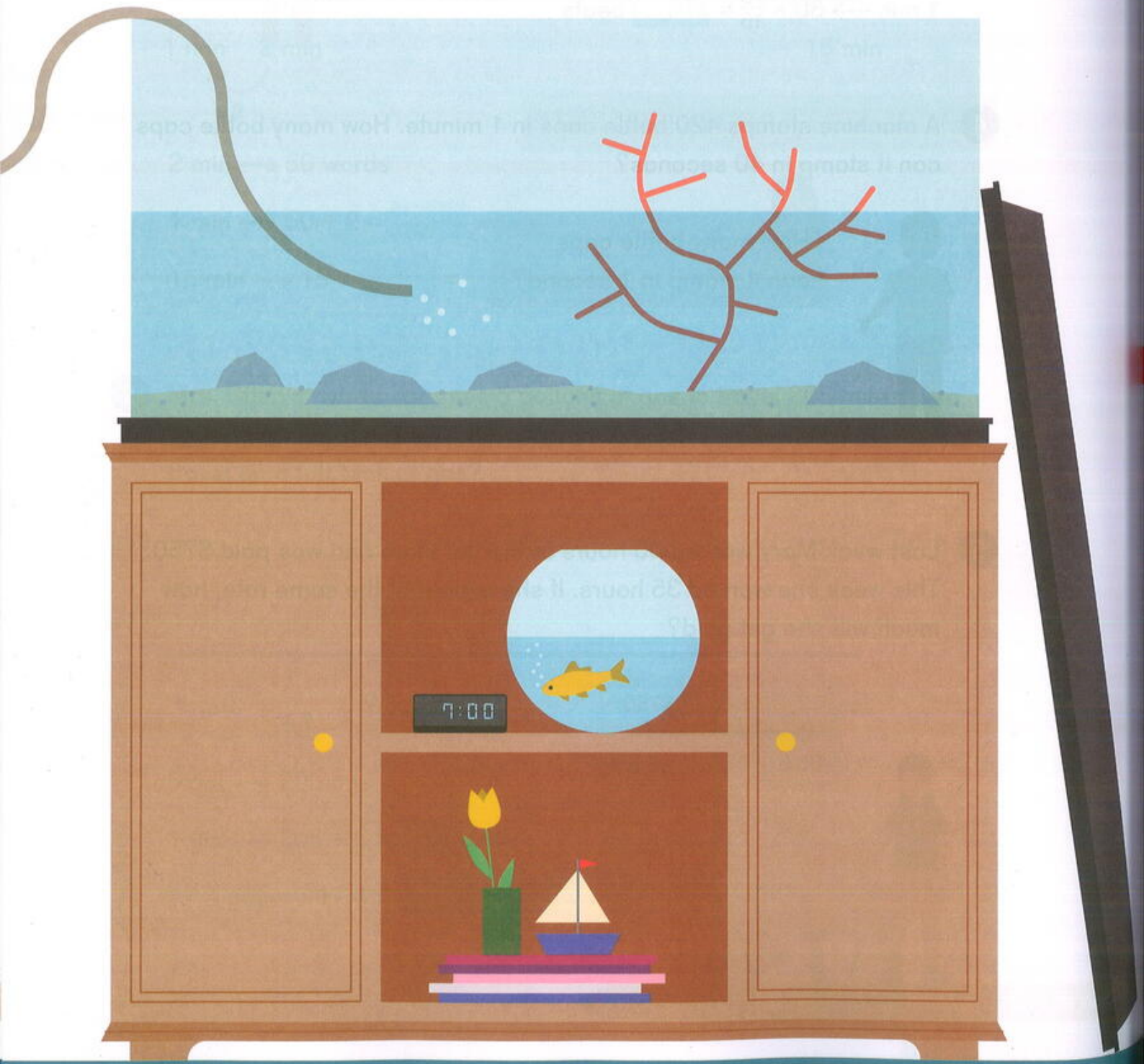
Exercise 2 • page 158

Lesson 3
Rate Problems — Part 2

3

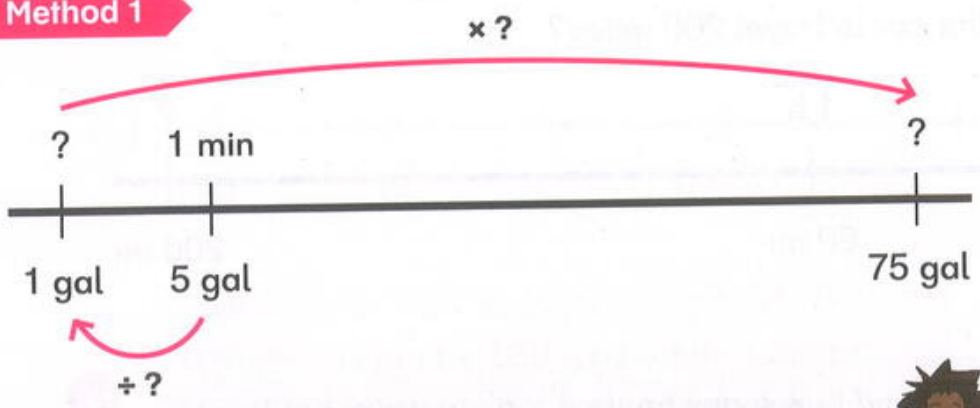
Think

Water is flowing into a tank at a rate of 5 gallons per minute. The capacity of the tank is 75 gallons. How long will it take to fill the tank?



Learn

Method 1



$5 \text{ gal} \longrightarrow 1 \text{ min}$

$1 \text{ gal} \longrightarrow \frac{1}{5} \text{ min}$

$75 \text{ gal} \longrightarrow 75 \times \frac{1}{5} = 15 \text{ min}$

I can find the number of minutes for one gallon...



Method 2



$75 \div 5 = 15$

It will take _____ min to fill the tank.

Do

1 A car is traveling 50 miles per hour on the highway. At this rate, how long will it take the car to travel 200 miles?

(a)



First, I found how many hours it took to drive 1 mile.



$50 \text{ mi} \longrightarrow 1 \text{ h}$

$1 \text{ mi} \longrightarrow \frac{1}{50} \text{ h}$

$200 \text{ mi} \longrightarrow 200 \times \square = \square \text{ h}$

(b)



In 1 hour the car travels 50 miles. How many 50 mile units are in 200 miles?



$200 \text{ mi} \longrightarrow 200 \div 50 = \square \text{ h}$

2 It costs \$5 to buy 4 lb of peanuts. How many pounds of peanuts can you buy for \$30?

(a)



We need to find the number of pounds that can be bought for \$30, so I made 1 dollar the unit and found the pounds per dollar first.



\$5 ⟶ 4 lb

\$1 ⟶ ☐ lb

\$30 ⟶ 30 × ☐ = ☐ lb

(b)



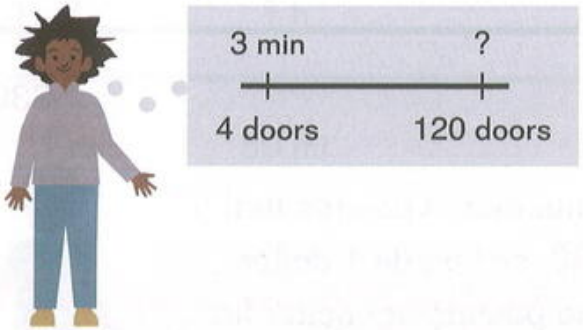
I found the cost per pound first. 4 lb costs \$5, so 1 lb costs \$$\frac{5}{4}$.



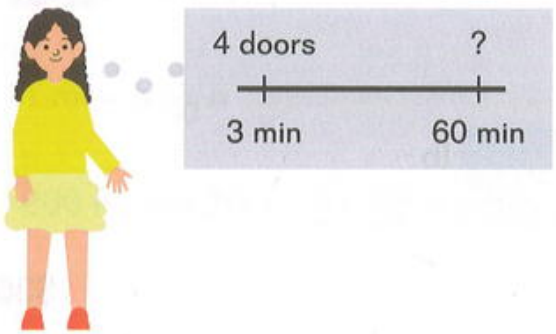
\$30 ⟶ 30 ÷ $\frac{5}{4}$ = ☐ lb

3 A robot at a car factory can install 4 car doors in 3 minutes.

(a) How long will it take to install 120 doors?



(b) How many doors can it install in 1 hour?

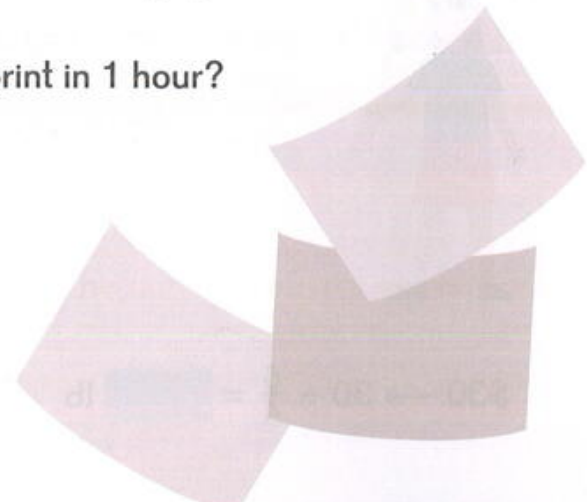


4 A photocopier can print 125 pages in 5 minutes.

(a) How long will it take to print 1,000 pages?

(b) How many pages can it print in 1 hour?

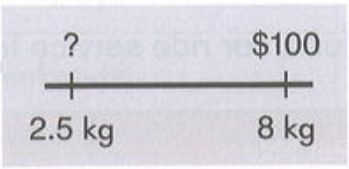




5 It costs $100 to buy 8 kg of shrimp.

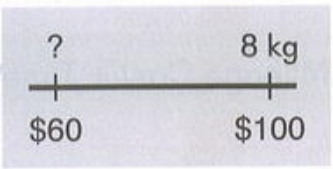
(a) How much does it cost to buy 2.5 kg of shrimp?



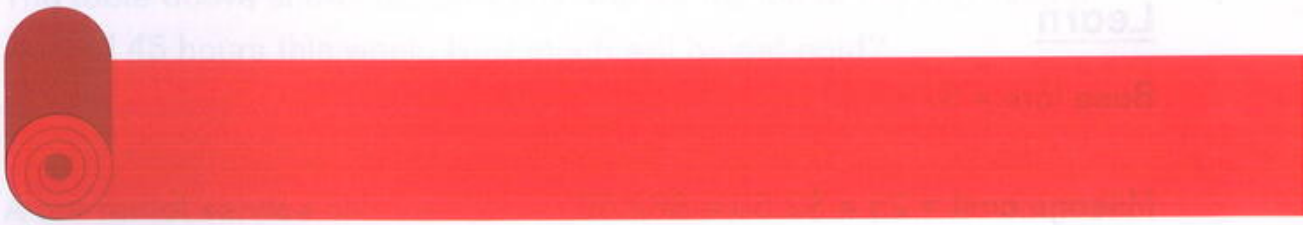


(b) How many kilograms of shrimp can you buy for $60?





6



A carpet store charges $960 to install 120 ft² of carpet.

(a) How much does it cost to install 100 ft² of carpet?

(b) How many square feet of carpet will it install for $1,000?

Exercise 3 • page 161

Think

The table below shows the charges for a car ride service for up to 4 passengers.

Base Fare	Per Mile	Per Minute
$7	$2.50	$0.30

Mei and her mom are taking the car ride service to the airport. It is a 25 mile ride and it takes 45 minutes to get there. How much will it cost?



Total Cost = Base Fare + Mileage Cost + Time Cost

Learn

Base fare = $7

Mileage cost = 25 × $2.50 = $62.50

Time cost = 45 × $0.30 = $13.50

$7 + $62.50 + $13.50 = $83.00

It will cost $_____.

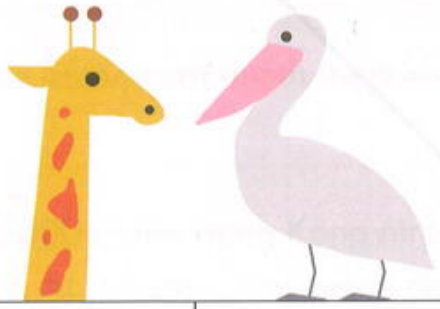
Do

1 A parking garage charges the following rates.

Weekdays	$25 per day
Weekends	$30 per day

Dion's dad parked his car in the garage on Sunday, Monday, and Tuesday. How much did he pay?

2



Up to 40 hours	$15 per hour
Additional hours above 40 hours	$22.50 per hour

The table above shows Jason's pay rate for his job at the zoo. Jason worked 45 hours this week. How much will he get paid?

3 A car rental service charges $32 per day to rent a car plus an additional $0.25 for every mile driven over 100 miles. Mr. Gonzalez rented a car for 5 days and drove 150 miles. How much does he have to pay?

4 A 20 L tank is filled to capacity with water. A tap used to drain the water flows at a rate of 2.5 L per minute. Zoltan wants to drain half of the water from the tank. How long will it take?

5 The line graph shows the exchange rate between US dollars (USD) and Qatari riyals (QAR) on a particular day.



(a) How many QAR can be exchanged for 1 USD?

(b) How many USD can be exchanged for 15 QAR?

(c) Maria exchanged 350 USD for QAR. How many QAR did she receive?

(d) Ali exchanged 1,500 QAR for USD. How many USD did he receive?

Exercise 4 • page 164

1. Kona's resting heart rate is 65 beats per minute. At this rate, how many times will her heart beat in 1 hour?

2. A flooring company charges $10.75 per square foot to install wood flooring. What would the cost be to install flooring in a 144 square foot room?

3. 80 g of white truffles costs $400. How much does 25 g of truffles cost?

4. Ricardo exchanged US $300 at the Hong Kong airport and received 2,250 Hong Kong dollars. At this rate, how many Hong Kong dollars would be exchanged for US $500?

5. A road crew can pave 3 miles of road in 5 days.

   (a) At this rate, how long will it take them to pave 12 miles of road?

   (b) How many miles of road can the crew pave in 12 days?

6. An online clothing company charges $8.99 per shipment and $0.99 per item that is shipped. Last week, Hector ordered a jacket, 2 shirts, and a hat. This week he ordered 2 pairs of jeans and a pair of shoes. How much did he pay on shipping alone for both orders?



7 The table below shows the rates a shipping company charges to send freight from Thailand to the U.S.

Weight	Shipping Cost in Thai Baht (THB)
0 kg to 150 kg	37 THB per kg
151 kg to 999 kg	35 THB per kg
1,000 kg or more	32 THB per kg

A food company in Thailand is sending three shipments to the U.S.:

Shipment 1: 140 kg Thai ginger
Shipment 2: 450 kg Thai chilies
Shipment 3: 1,000 kg Jasmine rice

(a) What is the total shipping cost of all the shipments together in Thai baht?

(b) If the exchange rate on the day the products are shipped is 30 Thai baht for 1 US dollar, how much will the total shipping cost be in US dollars? Round your answer up to the next cent.

8 A hotel has the following rates for a room:

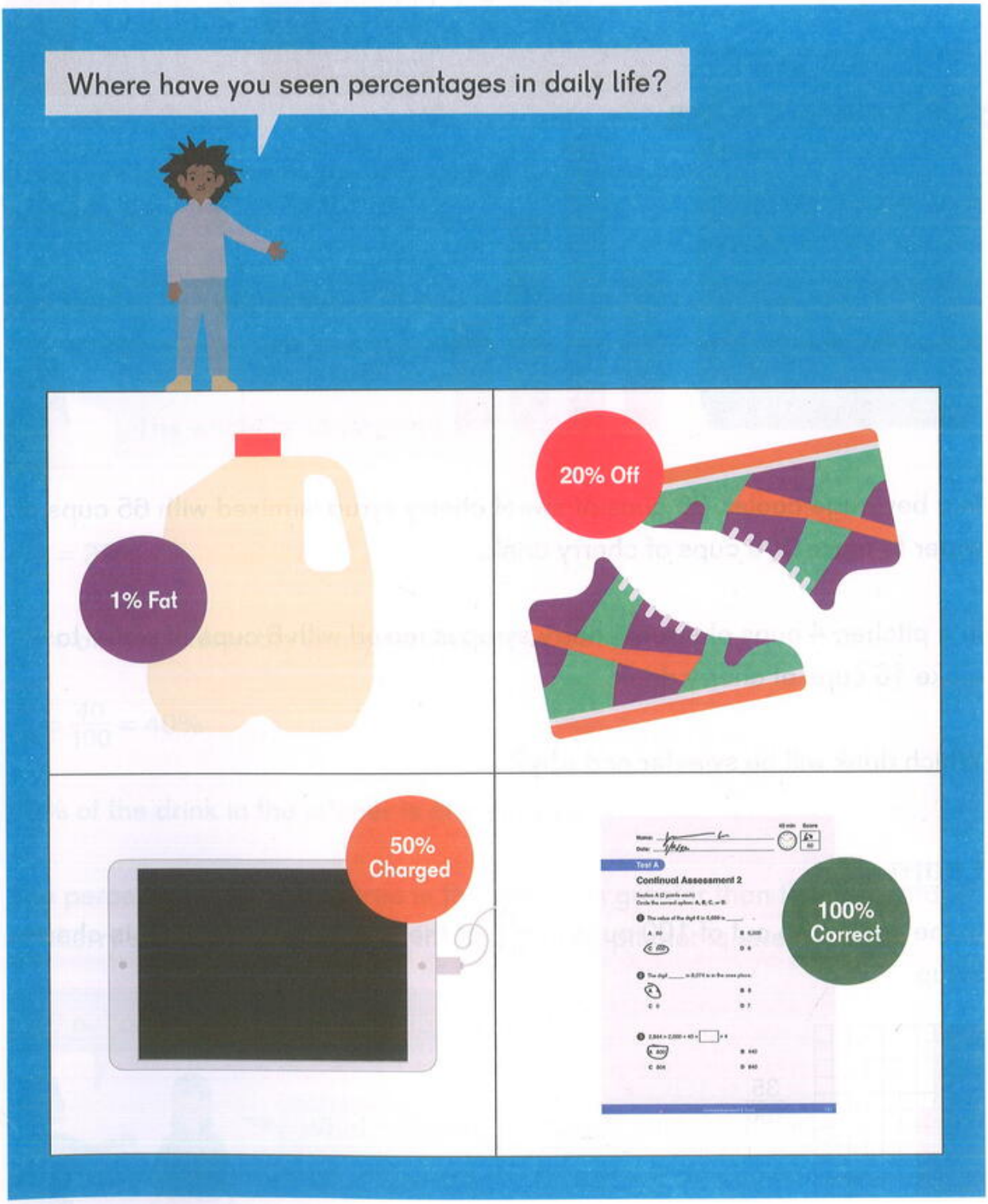
Monday — Thursday	$97.50 per night
Friday — Sunday	$128.75 per night
City Tax (all days)	$15.50 per night

Mrs. Lin booked a room for Wednesday, Thursday, Friday, and Saturday nights. How much was her total bill?

Exercise 5 • page 167

Chapter 15

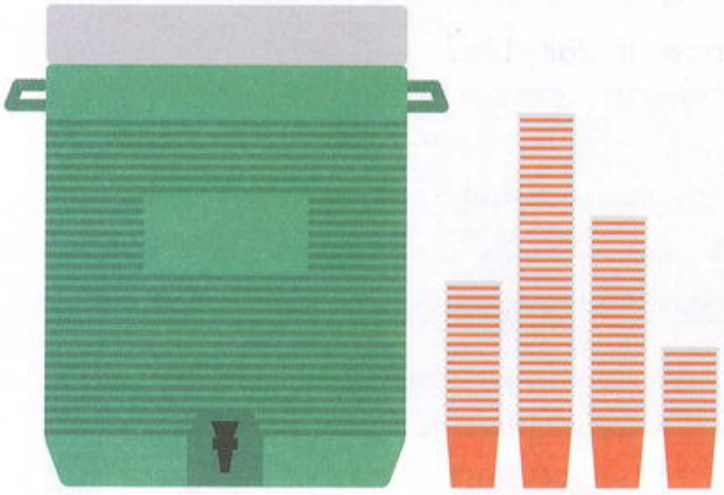
Percentage



Lesson 1
Meaning of Percentage

1

Think



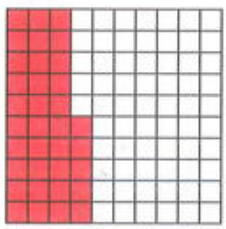
In a beverage cooler, 35 cups of sweet cherry syrup is mixed with 65 cups of water to make 100 cups of cherry drink.

In a pitcher, 4 cups of sweet cherry syrup is mixed with 6 cups of water to make 10 cups of cherry drink.

Which drink will be sweeter and why?

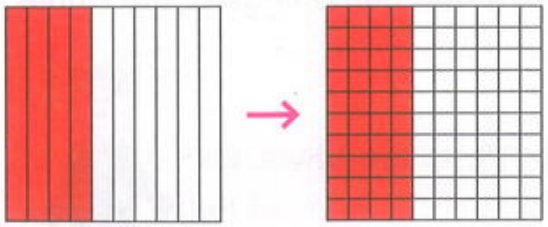
Learn

In the cooler, 35 out of 100 cups or $\frac{35}{100}$ of the total amount of drink is cherry syrup.



$\frac{35}{100}$

In the pitcher, 4 out of 10 cups or $\frac{4}{10}$ of the total amount of drink is cherry syrup.



$\frac{4}{10} = \frac{40}{100}$

If we consider the whole as 100, we can express a part of the whole as a **percentage**.

The symbol for percentage is **%** and it is read as **percent**.



Percent means **per hundred**.
The whole is considered as 100%.

$\frac{35}{100} = 35\%$

35% of the drink in the cooler is cherry syrup.

$\frac{4}{10} = \frac{40}{100} = 40\%$

40% of the drink in the pitcher is cherry syrup.

The percentage of cherry syrup in the pitcher is greater than the percentage of cherry syrup in the cooler, so the drink in the pitcher is sweeter.

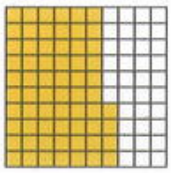
40 out of 100 is greater than 35 out of 100.



What percentage of each drink is water?

Do

1 A square is divided into 100 equal parts. What percentage of the whole square is shaded?

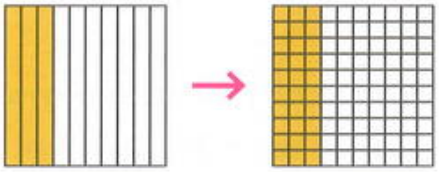




Each part is 1% of the whole.

64 out of 100 = $\frac{\square}{100}$ = $\square$ %

2 A square is divided into 10 equal parts. What percentage of the square is shaded?



$\frac{3}{10} = \frac{?}{100}$ (× 10, × 10)



3 Express each fraction as a percentage.

(a) $\frac{58}{100}$ (b) $\frac{9}{100}$ (c) $\frac{3}{10}$

(d) $\frac{8}{10}$ (e) $\frac{100}{100}$ (f) $\frac{10}{10}$

4 7 out of 10 students in the science club are girls.

(a) What percentage of the students in the club are girls?

(b) What percentage of the students in the club are boys?

Exercise 1 • page 171

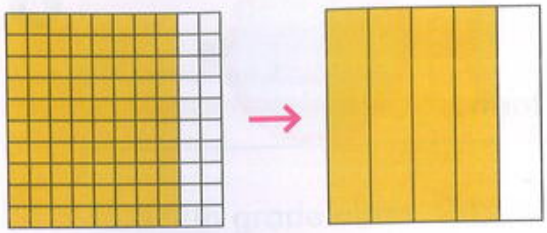
Lesson 2
Expressing Percentages as Fractions

2

Think

80% of the students in the math club are fifth graders and the rest are sixth graders. What fraction of the students in the math club are sixth graders?

Learn



Method 1

$80\% = \frac{80}{100} = \frac{4}{5}$

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

Method 2

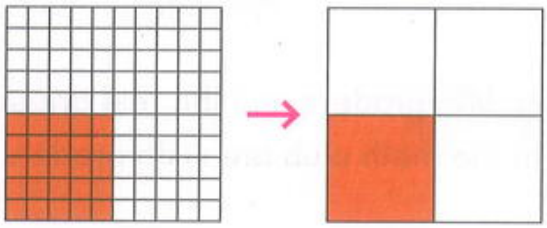
$100\% - 80\% = 20\%$

$20\% = \frac{20}{100} = \frac{1}{5}$

_____ of the students are sixth graders.

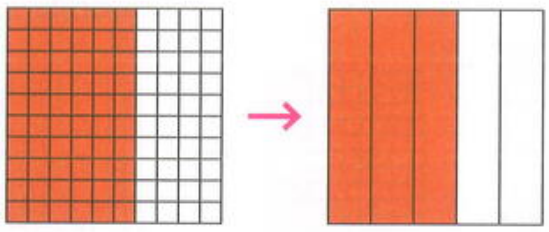
Do

1 Express 25% as a fraction in simplest form.



$25\% = \frac{\square}{100} = \frac{\square}{\square}$

2 Express 60% as a fraction in simplest form.



$60\% = \frac{\square}{100} = \frac{\square}{\square}$

3 Express each percentage as a fraction in simplest form.

(a) 50%

(b) 30%

(c) 75%

(d) 80%



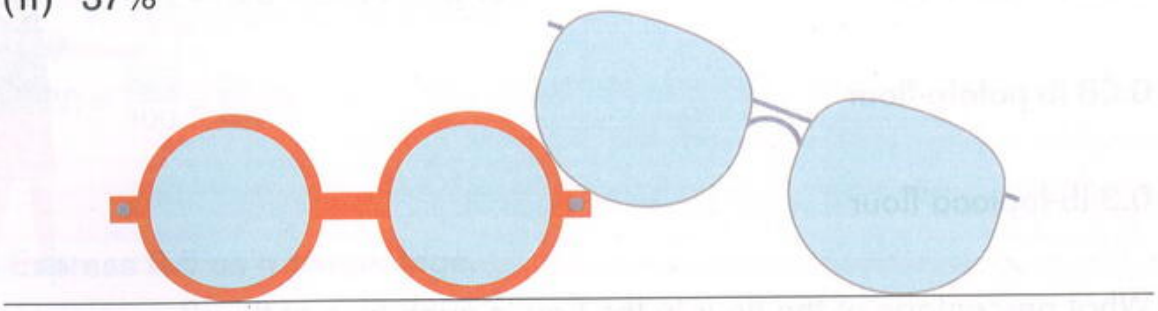
(e) 55%

(f) 12%

(g) 6%

(h) 37%

4



In a fifth grade class, 24% of the students wear glasses.

(a) What fraction of the students wear glasses?

(b) What fraction of the students do not wear glasses?

Express the fractions in simplest form.



5 In a bag of nuts, 45% of the nuts are almonds, 25% are cashews, and the rest are pistachios. What fraction of the blend is each type of nut?

Exercise 2 · page 173

Think

A 1 lb bag of gluten-free flour contains the following types of flour by weight.

0.62 lb rice flour

0.08 lb potato flour

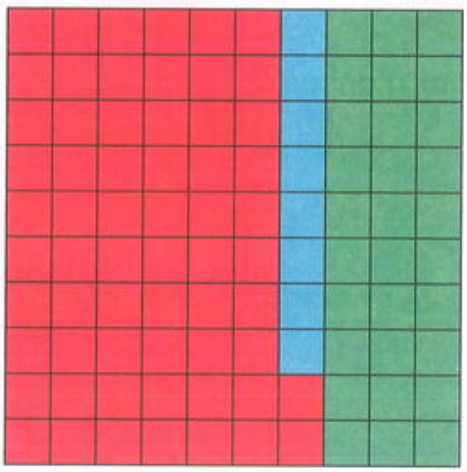
0.3 lb tapioca flour

$0.62 + 0.08 + 0.3 = 1$



What percentage of the flour in the bag is each type of flour?

Learn



Do the percentages add up to 100%?



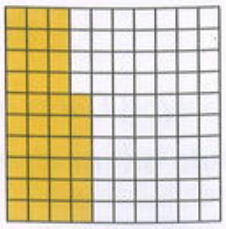
rice flour | $0.62 = \frac{62}{100} = 62\%$

potato flour | $0.08 = \frac{8}{100} = 8\%$

tapioca flour | $0.3 = \frac{3}{10} = \frac{30}{100} = 30\%$

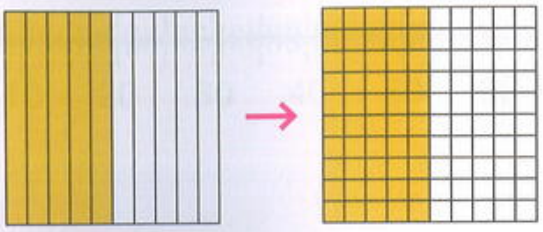
Do

1 Express 0.36 as a percentage.



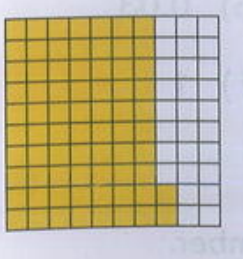
$0.36 = \frac{\square}{100} = \square\%$

2 Express 0.5 as a percentage.



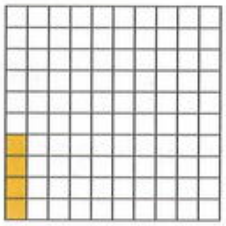
$0.5 = \frac{\square}{100} = \square\%$

3 Express 72% as a decimal.



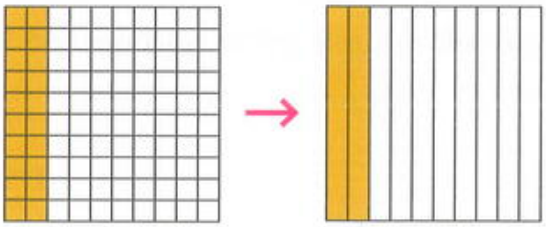
$72\% = \frac{\square}{100} = 0.\square\square$

4 Express 4% as a decimal.



$4\% = \frac{\square}{100} = 0.\square\square$

5 Express 20% as a decimal.



$20\% = \frac{\square}{100} = \frac{\square}{10} = 0.\square$

6 Express each number as a percentage.

(a) 0.84 (b) 0.23 (c) 0.03

(d) 0.1 (e) 0.9 (f) 1

7 Express each percentage as a decimal or whole number.

(a) 57% (b) 75% (c) 70%

(d) 20% (e) 9% (f) 100%

Exercise 3 • page 176

Lesson 4
Expressing Fractions as Percentages

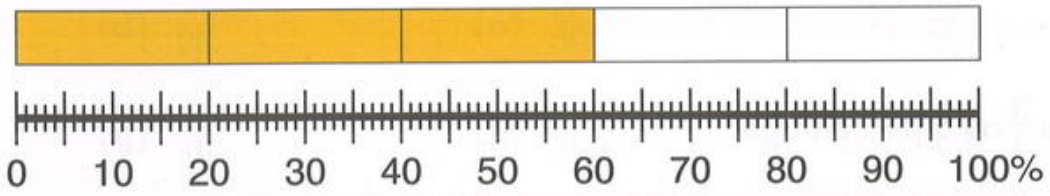
4

Think

There are 3 boys and 2 girls in the journalism club. What percentage of the students in the club are boys?

Learn

3 out of 5 or $\frac{3}{5}$ of the students are boys.



Method 1

$$\frac{3}{5} \overset{\times 20}{=} \frac{60}{100} = 60\%$$

Method 2

$$\frac{3}{\cancel{5}_{1}} \times \frac{\cancel{100}^{20}}{} \% = 60\%$$

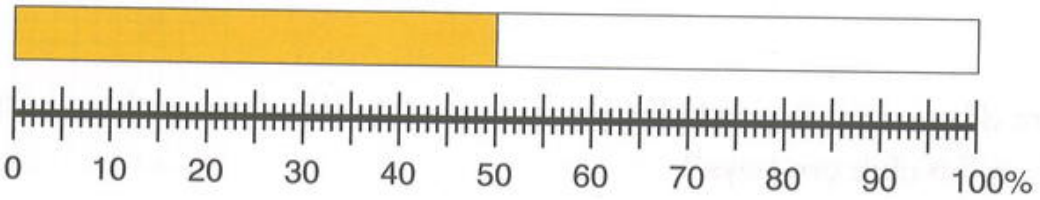
The total number of students is 100%. $\frac{3}{5}$ of the students are boys so $\frac{3}{5}$ of 100% is the percentage of students that are boys.



_____% of the students in the club are boys.

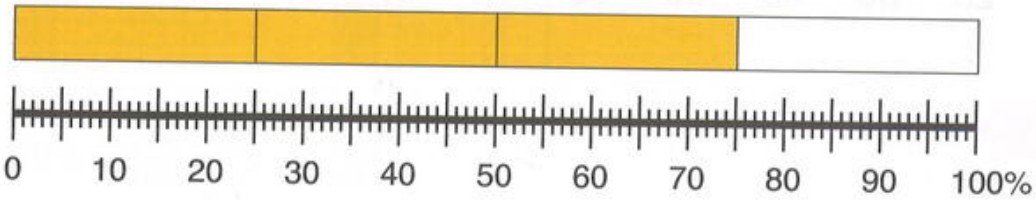
Do

1 Express $\frac{1}{2}$ as a percentage.



$\frac{1}{2} = \frac{\square}{100} = \square\%$ (× □ above and below)

2 Express $\frac{3}{4}$ as a percentage.

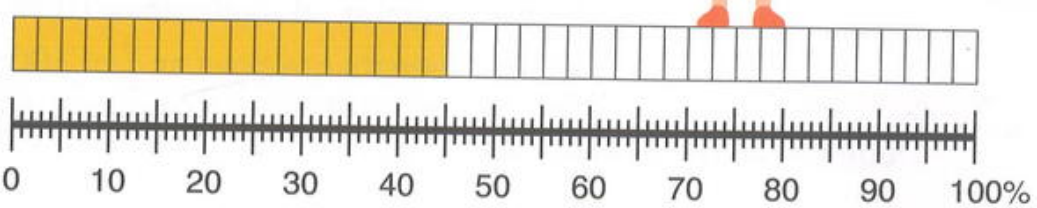


$\frac{3}{4} \times 100\% = \square\%$

$\frac{3}{\cancel{4}_{1}} \times \overset{25}{\cancel{100}}\%$



3 Express $\frac{18}{40}$ as a percentage.



$\frac{18}{40} \times 100\% = \square\%$

$\frac{\overset{9}{\cancel{18}}}{\underset{\cancel{20}_{1}}{\cancel{40}}} \times \overset{5}{\cancel{100}}\%$



4 Express $\frac{48}{200}$ as a percentage.

(a) $\frac{48}{200} \overset{\div \square}{=} \frac{\square}{100} = \square\%$

(b) $\frac{48}{200} \times 100\% = \square\%$

5 Express each fraction as a percentage.

(a) $\frac{1}{4}$ (b) $\frac{4}{5}$ (c) $\frac{5}{20}$

(d) $\frac{7}{25}$ (e) $\frac{28}{50}$ (f) $\frac{12}{60}$

(g) $\frac{8}{40}$ (h) $\frac{82}{200}$ (i) $\frac{45}{150}$

6



17 out of 20 students at a music school play piano.

(a) What percentage of the students at the school play piano?

(b) What percentage of the students at the school do not play piano?

Exercise 4 • page 178

1 Express each fraction as a percentage.

(a) $\frac{50}{100}$

(b) $\frac{38}{100}$

(c) $\frac{7}{10}$

(d) $\frac{1}{5}$

(e) $\frac{7}{20}$

(f) $\frac{14}{25}$

(g) $\frac{12}{40}$

(h) $\frac{36}{180}$

(i) $\frac{100}{250}$

(j) $\frac{8}{8}$

2 Express each percentage as a fraction in simplest form.

(a) 47%

(b) 10%

(c) 90%

(d) 65%

(e) 5%

(f) 8%

3 Express each decimal as a percentage.

(a) 0.48

(b) 0.09

(c) 0.2

(d) 0.6

4 Express each percentage as a decimal.

(a) 50% (b) 75% (c) 25%

(d) 40% (e) 3% (f) 8%

5 5% of the vehicles in a parking lot are motorcycles and the rest are cars. What percentage of the vehicles in the parking lot are cars?

6 Jonathan answered 45 out of 50 questions correctly on a test. What percentage of the questions did he answer correctly?

7 $\frac{3}{5}$ of the apples in a bag are Golden Delicious apples and the rest are McIntosh apples. What percentage of the apples in the bag are McIntosh apples?

8 6 out of 10 students in the science club are fifth graders. 11 out of 20 students in the reading club are fifth graders.

(a) What percentage of the students in each club are fifth graders?

(b) Which club has a higher percentage of fifth graders?

9 Maria earned $200 selling lemonade. She spent $28 on a book and saved the rest. What percentage of her money did she save?

Exercise 5 • page 181

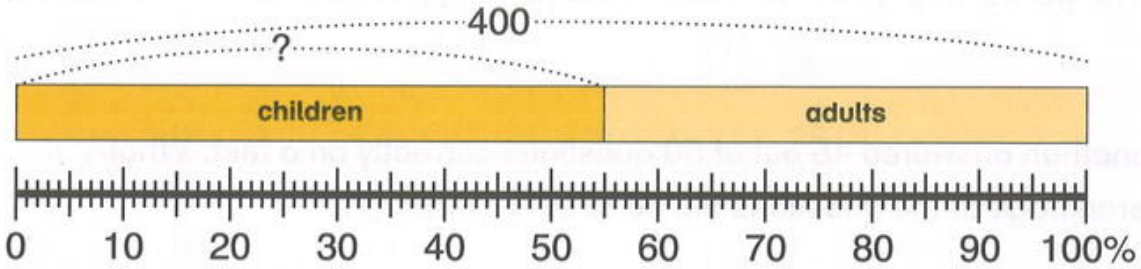
Lesson 6
Percentage of a Quantity

6

Think

There are 400 people at the carnival. 55% of them are children and the rest are adults. How many children are there?

Learn



Method 1

$55\% \longrightarrow \frac{55}{100}$

$\frac{55}{\cancel{100}_{1}} \times \cancel{400}^{4} = 220$

Method 2

$100\% \longrightarrow 400$

$1\% \longrightarrow \frac{400}{100} = 4$

$55\% \longrightarrow 55 \times 4 = 220$

There are _____ children.

50% is $\frac{1}{2}$ so it will be a little more than half of 400.

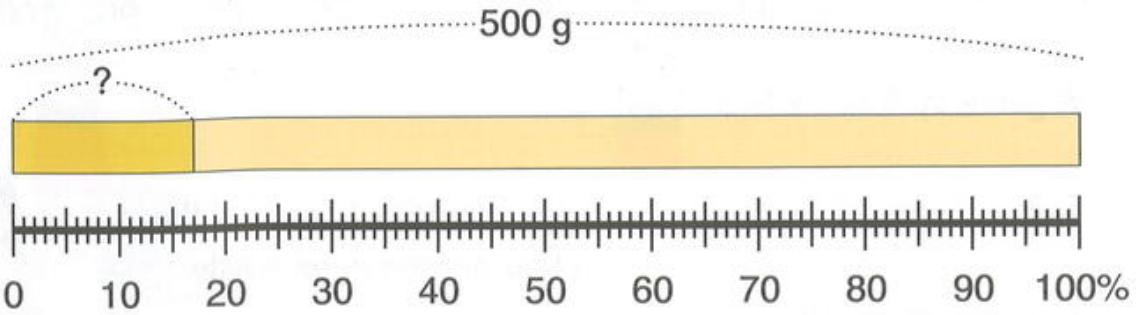


If we find 1% of an amount it is easy to find other percentages of that amount.



Do

1 The recommended daily amount of fiber is 500 g. A bowl of oatmeal contains 17% of this amount. How many grams of fiber are in a bowl of oatmeal?

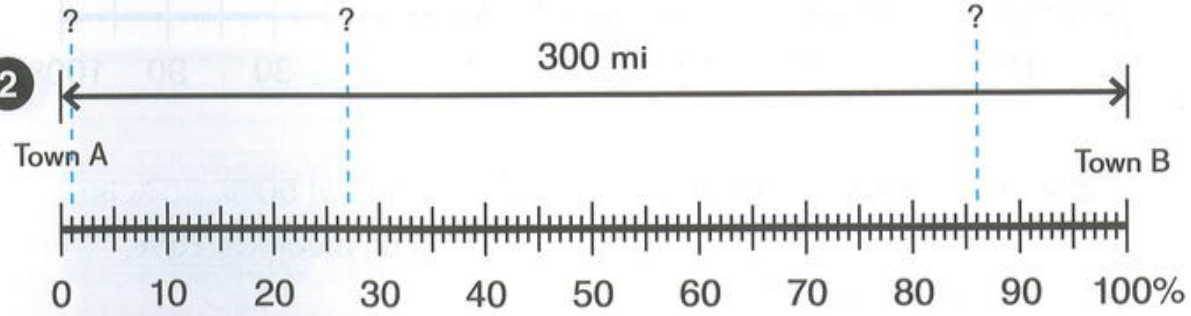


100% ⟶ 500 g

1% ⟶ $\frac{500}{100}$ = ☐ g

17% ⟶ 17 × ☐ = ☐ g

2



The distance from Town A to Town B is 300 mi. Find:

(a) 1% of the distance.

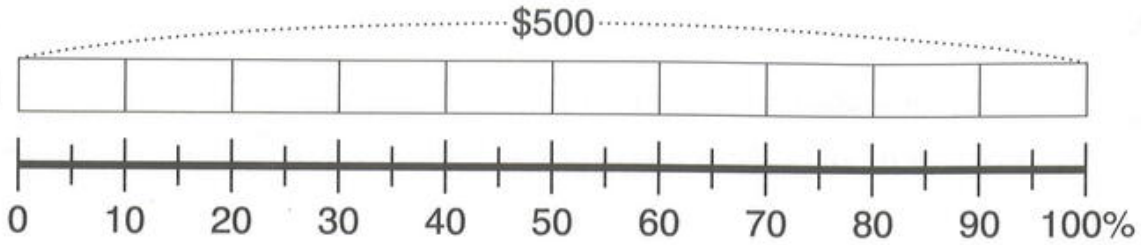
(b) 27% of the distance.

(c) 86% of the distance.

If I know 1% I can find 27% and 86% easily.



3



A game system costs $500. Find...

(a) 10% of the cost.

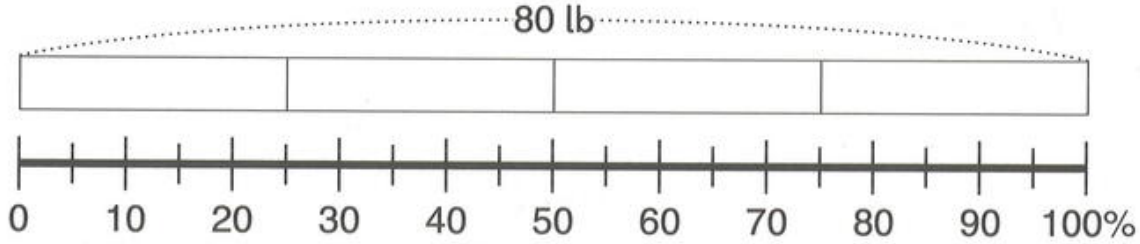
(b) 5% of the cost.

(c) 20% of the cost.

If I know 10% I can find the other percentages easily.



4



A suitcase weighs 80 lb. Find...

(a) 50% of the weight.

(b) 25% of the weight.

(c) 75% of weight.

25% is half of 50%. 75% is 3 times as much as 25%.



5 Marilyn had $180. She put 40% of it into her savings account. How much money did she put in her savings account?



$\frac{40}{100} \times 180$



$4 \times \frac{180}{10}$

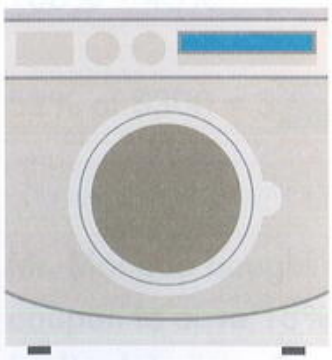
6 Find the values.

(a) 5% of 3,200

(b) 12% of 800

(c) 45% of 80

(d) 90% of 160

7 

Grace bought a dryer for $1,200. She had to pay a 6% sales tax. How much sales tax did she pay?

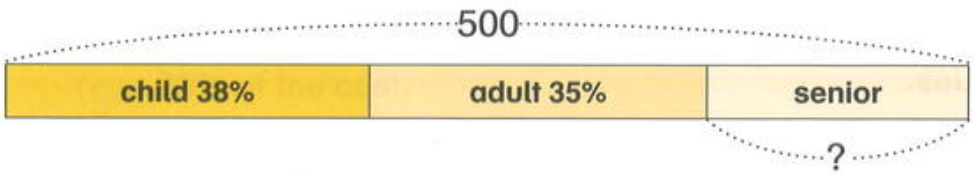
8 The usual price of a dishwasher is $800. A store is offering a 25% discount on the usual price. How much is the discount?

Exercise 6 • page 184

Think

A movie theater sold 500 tickets. 38% of the tickets were child tickets, 35% were adult tickets, and the rest were senior tickets. How many senior tickets were sold?

Learn



Method 1

$100\% - (38\% + 35\%) = 100\% - 73\% = 27\%$

27% of $500 = \frac{27}{100} \times 500 = 135$

Method 2

$38\% + 35\% = 73\%$

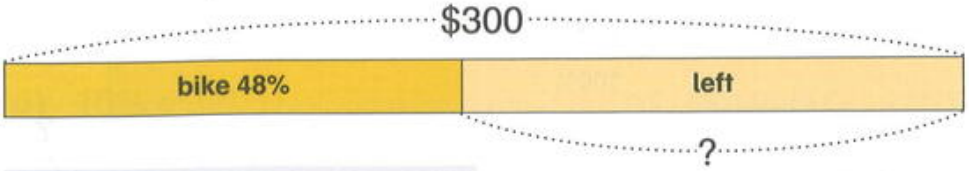
73% of $500 = \frac{73}{100} \times 500 = 365$

$500 - 365 = 135$

_____ senior tickets were sold.

Do

1 Felipe had $300. He spent 48% of his money on a bike. How much money does he have left?



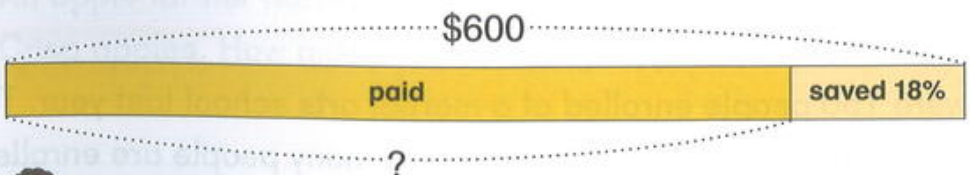
He will have a little more than half of his money left.



100% − 48% = 52%

52% of $300 = $ ____

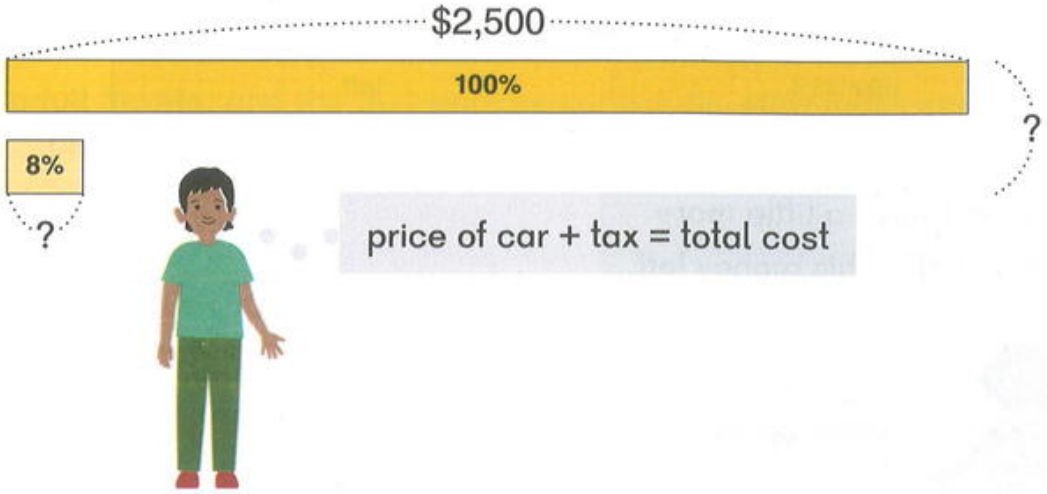
2 Mr. Macedo bought a television that usually costs $600. He used a coupon to save 18% off the usual price. How much did Mr. Macedo pay for the television?





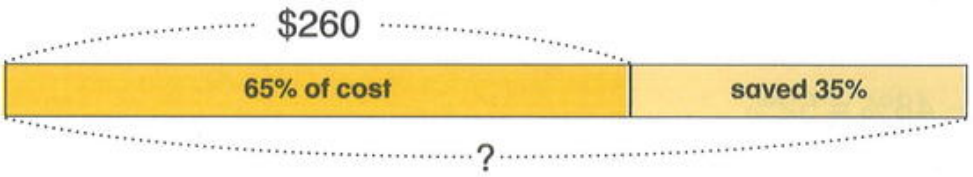
100% − 18% = 82%

3 Miss Harold wants to buy a used car that has a price of $2,500. In addition to the price of the car, she has to pay a sales tax of 8%. What will be the total cost of the car?



price of car + tax = total cost

4 65% of the cost of a TV was $260. What was the original cost?





$65\% \longrightarrow 260$

$1\% \longrightarrow \frac{260}{65}$

$100\% \longrightarrow ?$

5 There were 150 people enrolled at a martial arts school last year. This year the enrollment decreased by 8%. How many people are enrolled at the school this year?

Exercise 7 • page 187

1 Find the values.

(a) 10% of 80

(b) 5% of 60

(c) 15% of 200

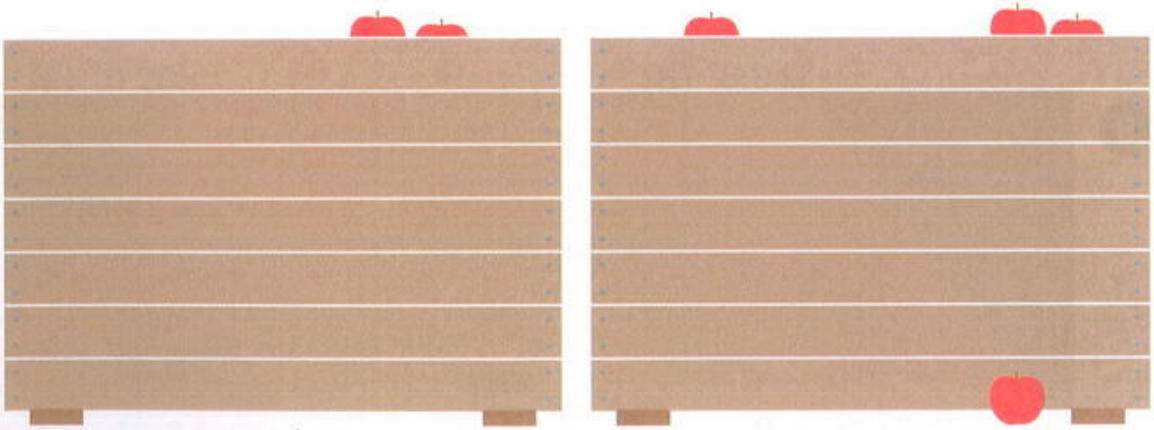
(d) 67% of 400

(e) 75% of 4,800

(f) 35% of 760

2 Diya makes $850 each week working at the animal shelter. She saves 20% of her salary every week. How much money does she save each week?

3



An apple farmer harvested 3,000 apples. 65% of them were Cosmic Crisp apples. How many Cosmic Crisp apples did she harvest?

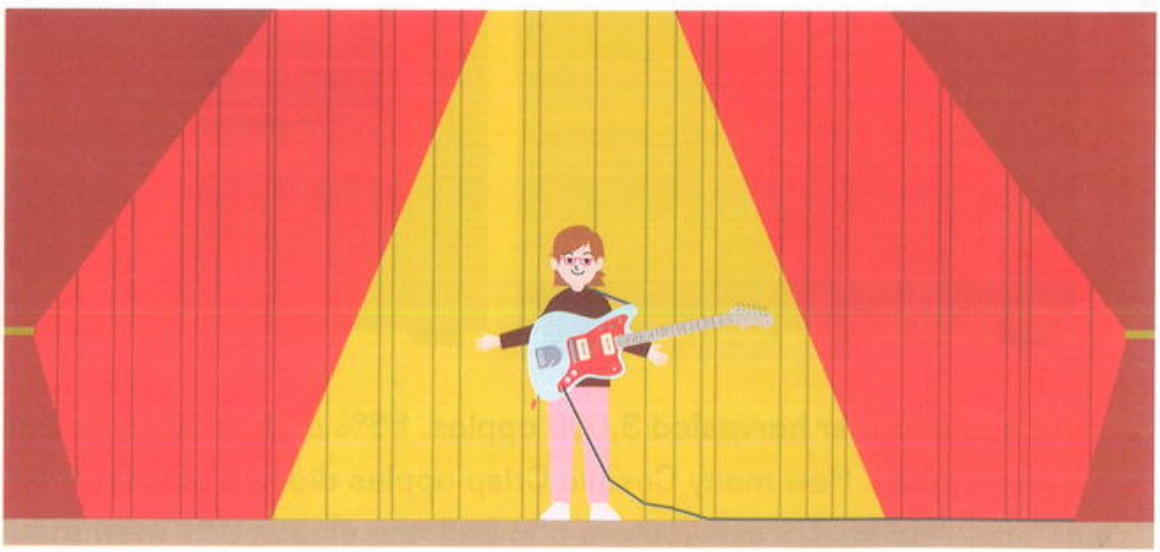
4 Santiango bought a computer that had a price of $2,300. He used a coupon to save 15% off the price of the computer. How much did he pay for the computer?

5 Last year, the astronomy club had 325 members. This year the membership increased by 12%. How many members are in the club this year?

6 There are 550 students going on a field trip. 30% are third graders, 32% are fourth graders, and the rest are fifth graders. How many fifth graders are going on the trip?

7 The Turner family went out to dinner. The check was $150, and they left an 18% tip. How much did they spend?

8 Cameron bought a pair of sneakers for $140. He used a coupon to get a 15% discount and paid 6% sales tax on the discounted price. How much did he spend?

9 

52% of the people at a concert are adults, and the rest are children. There are 182 adults at the concert. How many people are at the concert?

Exercise 8 • page 190

1 Express each fraction or mixed number as a decimal.

(a) $\frac{18}{250}$ (b) $4\frac{7}{20}$

2 Write the following in numerals.

(a) Thirty-four million, one hundred thousand, forty

(b) One thousand times as much as six hundred seven thousand, five

3 Write the following numbers in expanded form.

(a) 0.205 (b) 6.047

4 Order the numbers from least to greatest.

(a) 6.25, 62.5, 0.625, 625

(b) $\frac{3}{7}$, 0.42, $\frac{47}{10}$, $\frac{23}{500}$, 0.45

5 Round each number to the second decimal place, to the first decimal place, and to a whole number.

(a) 0.825 (b) 6.042

6 Find the values. Express each answer as a whole number, fraction, or mixed number in simplest form.

(a) $7{,}200 \div 10 - 5 \times 20$

(b) $40 - 17 + 21 \div 3$

(c) $408 \div (20 - 3)$

(d) $42 + 1{,}470 \div 21$

(e) $47 \div 5 + 5\frac{1}{3}$

(f) $8 \times \frac{2}{3} \times \frac{5}{6}$

(g) $2 \div \frac{4}{7} + \frac{2}{5}$

(h) $\frac{1}{3} \div 6 \times 12$

7 Express each ratio in simplest form.

(a) 40 : 64 : 72

(b) 12 : 36 : 54

8 A 16 m rope is cut into 5 equal length pieces. How many meters long is each piece?

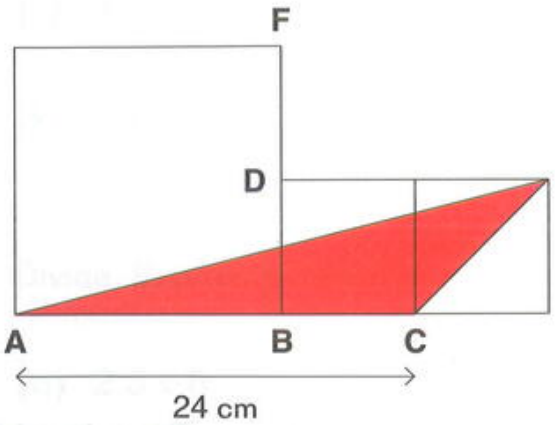
9 A red ribbon is 0.8 m long and a blue ribbon is 47 cm long. Which ribbon is longer and by how much?

10 A small bag of coffee weighs 2.35 lb. A large bag of coffee weighs twice as much as the small bag of coffee. Glen bought a small bag and a large bag and has used 1.25 lb of coffee so far. How much coffee does he have left?

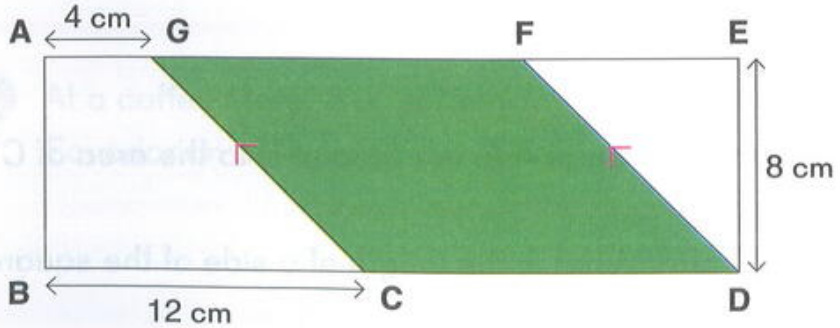
11 4 large containers each contain 8.35 L of paint. The paint from the containers is then poured equally into 5 smaller containers. How much paint is in each of the smaller containers? Express the answer in liters and milliliters.

12 The ratio of macaws to cockatoos to parrots at a pet store is 2 : 3 : 5. There are 15 parrots. How many macaws and how many cockatoos are there?

13 The figure is made up of three squares. AC = 24 cm. BD = DF. Find the area of the shaded part.



14 The area of Rectangle AEDB is 208 cm². GC is parallel to FD. AG = 4 cm, BC = 12 cm, and DE = 8 cm. Find the shaded area.

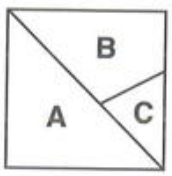


15 A rectangular tank 60 cm long, 50 cm wide, and 30 cm high was partly filled with water. It was then filled with more water using a hose. The water from the hose flowed into the tank at a rate of 6 L per min. It took 8 minutes to fill the tank completely. What was the volume of water in the tank before the hose was turned on?

16 A veterinarian measured and recorded the weight of 5 baby rabbits to the nearest hundredth of a kilogram. What is the average weight of the rabbits, rounded to the nearest hundredth of a kilogram?

Rabbit	Weight (kg)
Fluffy	0.42
Jasmine	0.35
Jack	0.37
Briar	0.50
Rosie	0.45

17 A square is divided into 3 parts, A, B, and C, as shown. The ratio of the area of C to the area of A is 3 : 8.



(a) What is the ratio of the area of A to the area of B to the area of C?

(b) The area of B is 20 cm^2. What is the length of a side of the square?

Exercise 9 • page 193

1 Find the values.

(a) $0.36 + 2.509$

(b) $0.4 - 0.378$

(c) $0.72 \div 8 \times 300$

(d) 14.5×0.01

(e) 80×0.25

(f) 35.9×0.47

(g) $5.4 \div 900$

(h) $4.48 \div 8$

(i) 7.03×0.1

(j) $658 \div 0.28$

(k) $3.2 + 8.5 \times 0.5$

(l) $18 \times 4.7 + 22 \times 4.7$

2 Divide. Express the quotients correct to the second decimal point.

(a) $2.3 \div 8$

(b) $7 \div 0.6$

(c) $\frac{6}{7}$

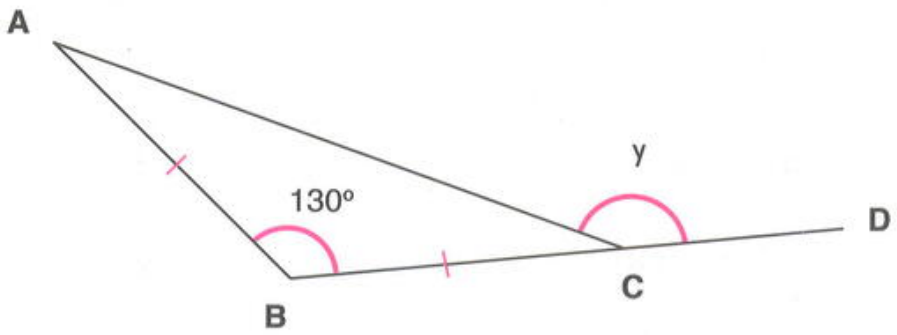
(d) $\frac{1}{2} \div 6$

(e) $643 \div 23$

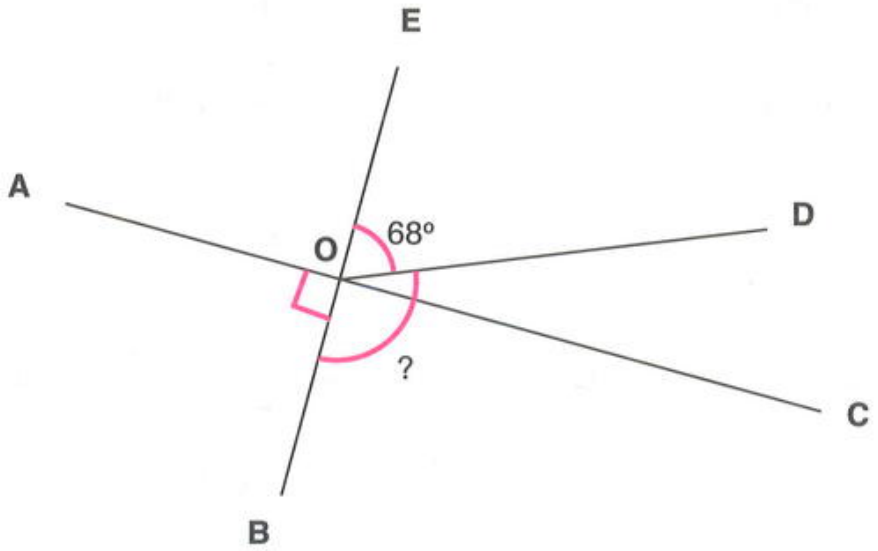
(f) $69 \div 0.33$

3 At a coffee store, 3 lb of Kenyan coffee sells for $37.50. 5 lb of Ecuadorian coffee sells for $61.25. Which coffee costs less per pound?

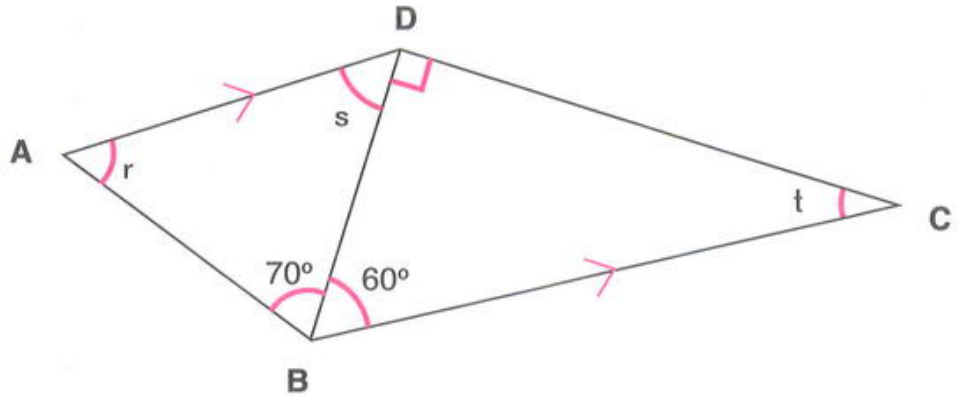
4 ABC is an isosceles triangle. BD is a straight line. What is the measure of ∠y?



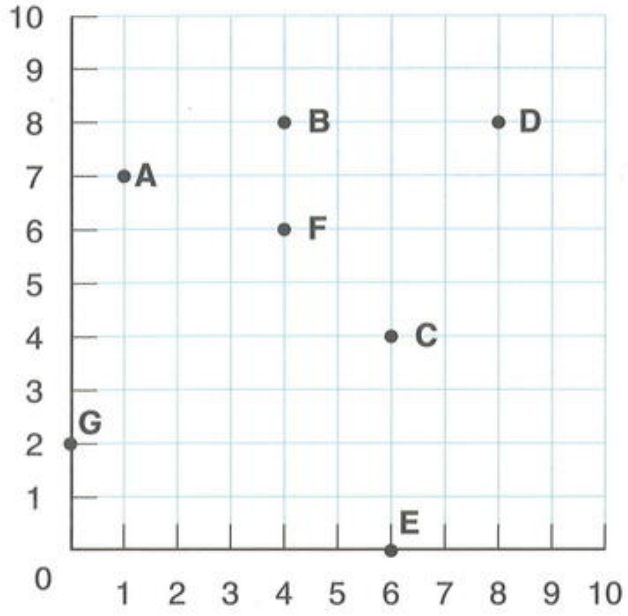
5 AC and BE are straight lines. What is the measure of ∠BOD?



6 ABCD is a trapezoid. AD is parallel to BC. What are the measures of Angles r, s, and t?



7 (a) Write the coordinates of each point.



(b) Name the coordinates of a Point H, such that Figure ABCH is a parallelogram.

8 The ratio of the weights of Suitcase A to Suitcase B to Suitcase C is 5 : 4 : 1. Suitcase B weighs 9.3 lb more than Suitcase C. How much do the suitcases weigh altogether?

9 

The average height of 5 students on the basketball team is 172 cm. The heights of 4 of the students are 170 cm, 168 cm, 175 cm, and 169 cm. What is the height of the fifth student?

10. A hose takes 4 minutes to fill a 20 L water tank.

    (a) What fraction of the tank will it fill in 3 minutes?

    (b) How long would it take to fill a 30 L tank?

11. Find the values.

    (a) 35% of 80

    (b) 4% of 300

12. Louis made $4,500 working a summer job. He spent 25% of his money on ski equipment and saved the rest. How much money did he save?

13. An electronics store is offering a discount of 30% on the total cost of a purchase. Charlie wants to buy a television for $500 and a game system for $200.

    (a) How much money will he save if he buys both items?

    (b) There is a 5% sales tax on the total purchase. What will be the total cost including tax?

14. There are 240 marbles in a container. 30% of the marbles are red, $\frac{1}{5}$ of the marbles are blue, and the rest are green. If half of the green marbles are removed, what fraction of the total marbles would be green?

Exercise 10 • page 198