Grades 6–8

Part 1 of 2
Poster/Teaching Guide

Expect the Unexpected With Math™

CONVERSIONS ROCK

Lessons & Worksheets to Build Skills in
Equivalent Conversions

Aligned with NCTM Standards

Math Grants Available

(details inside)

THE ACTUARIAL FOUNDATION®

Dear Teacher:

Welcome to Conversions Rock, a new math program designed to build and reinforce the important skills of converting fractions, decimals, and percents for students in grades 6–8.

Developed by The Actuarial Foundation, this program seeks to provide skill-building, real-world math to help your students become successful in the classroom and beyond. We hope you enjoy this new program!

Sincerely,

The Actuarial Foundation

GETTING STARTED

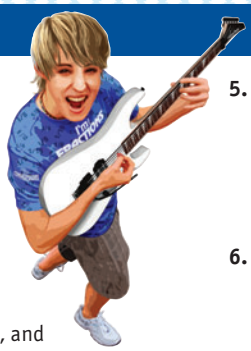
In the following three lessons and activities, students will **learn and reinforce skills for equivalent conversions of fractions/decimals/percents** through a young band called The Conversions. Each member of the band has a math specialty that he or she uses to help make the band successful. **Nikki, the guitarist, is fascinated by fractions. Dezzy digs decimals. Bailey is a pro with percents.** Each of the three lessons and worksheets focuses on one of these key areas. In addition, the accompanying booklet has Bonus Worksheets and a class set of Family Activity pages tied to the lessons.

Before launching the lessons and activities, engage students to discuss real-world applications of fractions/decimals/percents. *In what ways do people use these math tools in their daily lives?* Invite students to bring in examples they find in the real world (e.g., recipes, magazines, statistics).

The **classroom poster** provides tips for equivalent conversions that can be displayed year-round in the classroom. Before displaying the poster, be sure to make copies of all lessons and worksheets on the poster back.

Lesson 1: Fractions

Stardom: Just a Fraction Away



OBJECTIVES: Students will understand key features about **fractions** and how to convert them to equivalent decimals and percents.

Time Required: 10 minutes, plus additional time for worksheets

Materials: Student Worksheet 1, Bonus Worksheet 1

DIRECTIONS:

1. Students need to know that fractions, decimals, and percents are all ways of expressing parts of a whole. Start a basic review lesson by drawing a square on the board.
2. Draw a line vertically through the center of the square. Ask students what fractions you have drawn. [The answer is a 1/2 and a 1/2.] Write an equation on the board showing how two halves added together equal a whole. [1/2 + 1/2 = 2/2 or 1]
3. Ask students to show this same equation in decimals. To get the decimal equivalent of a fraction, divide the numerator (the top number of a fraction) by the denominator (the bottom number of a fraction). So 1/2 is 1 ÷ 2 or 0.5. The equation in decimals is 0.5 + 0.5 = 1.0.
4. Ask students to show the same equation in percents. A percent means "out of 100." By moving the decimal point two places to the right, you are multiplying the decimal by 100 to arrive at the percent. So, 0.5 x 100 = 50%. The equation in percents is 50% + 50% = 100%.
5. Draw another line horizontally through the square, cutting it in half again. Ask students to describe one of the 4 equal pieces as a fraction [1/4], as a decimal [0.25], and as a percent [25%]. Then draw two lines diagonally through the center of the square to create 8 equal pieces. Ask students to describe each piece as a fraction [1/8], a decimal [0.125], and a percent [12.5%].
6. Draw a new empty square on the board. Ask students how to divide a square into 5 equal shapes. [The easiest way is to make 5 equal bars.] Ask how to describe one of the 5 pieces as a fraction, decimal, and percent. [1/5, 0.20, and 20%]
7. Tell students that some fractions are not as easy to convert into decimals and percents. For example, draw an empty box again and divide into 3 equal bars. Ask students to describe a piece as a fraction [1/3]. Now ask them to show the piece as a decimal and as a percent. The answer is $1 \div 3 = 0.\overline{3}$ to infinity or $33.\overline{3}\%$ to infinity. A line drawn over the top of a number means the number continues infinitely.
8. Tell students that to add fractions, each needs a common denominator. Ask students how to get the sum of 1/3 + 1/2. [Change 1/3 to 2/6 and 1/2 to 3/6. The answer is 5/6.]
9. Distribute **Student Worksheet 1**. Tell students they should complete all the questions. Explain that for the bonus question, ratios and proportions can help solve the problem. A ratio is a comparison of two numbers. For example, the ratio of 1 and 4 can be written as 1:4, or as the fraction 1/4. A proportion is two equal ratios, such as 1/4 = 2/8. Go over correct answers as a class using the **Worksheet Answer Key** (see inside back cover).

Lesson 2: Decimals

Rock to the Top with Decimals

OBJECTIVES: Students will understand key features about **decimals** and how to convert them to equivalent fractions and percents.

Time Required: 10 minutes, plus additional time for worksheets

Materials: Student Worksheet 2, Bonus Worksheet 2

DIRECTIONS:

1. Students need to know that decimals, like fractions and percents, are another way of expressing portions of a whole.
2. Tell students that they may be familiar with decimals as they are used with money (100 cents = $1.00, 50 cents = $0.50). When you say a decimal out loud, you express it in terms of tenths, hundredths, or thousandths. The first place after the decimal point represents 10ths, the 2nd place represents 100ths, and the 3rd place represents 1,000ths. For example, you say the decimal 0.2 as two tenths. You say the decimal 0.25 as twenty-five hundredths. You say the decimal 0.125 as one hundred and twenty-five thousandths.
3. As soon as you say a decimal aloud, students can see how it converts into a fraction. After converting a decimal to a fraction, show how to simplify it. For example, 0.2 is 2/10, which can be reduced to 1/5. 0.25 is 25/100, which can be simplified to 1/4.
4. Remind students that certain fractions do not convert into simple decimals. For example, 1/3 becomes $0.\overline{3}$ to infinity because that is the result you get when dividing 1 by 3.
5. To convert a decimal to a percent, students move the decimal point two places to the right. A percent means "out of 100" or "per 100," so by moving the decimal point two places to the right, you are multiplying the decimal by 100 to arrive at the percent. For example, 0.2 = 20% (0.2 x 100); 0.25 = 25% (0.25 x 100).
6. Distribute **Student Worksheet 2**. Read the first paragraph aloud to your class and have students complete the problems. Have students read their answers aloud. Hearing decimals read aloud reinforces how they convert into fractions. Have someone write down their decimal answers to Question 3, and have them show how the numbers added together equal 1. The student should write on the board:

```
    0.125
+   0.248
+   0.627
    1.000  or 1
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Be sure to go over all correct answers using the **Worksheet Answer Key** (see inside back cover).

MATH GRANTS & OTHER EDUCATION RESOURCES AVAILABLE AT
www.actuarialfoundation.org/grant/index.html

- Advancing Student Achievement® Grants
- Shake, Rattle, & Roll (Grades 6–8)
- Bars, Lines, & Pies (Grades 4–6)
- The Math Academy Series: Using Math in the Real World
- Best Practices Guide

Free printable copies of this program available at:

www.scholastic.com/conversionsrock
www.actuarialfoundation.org/grant/index.html

Lesson 3: Percents

Show Me the Money with Percents

OBJECTIVES: Students will understand key features about **percents** and how to convert them to equivalent decimals and fractions.

Time Required: 10 minutes, plus additional time for worksheets

Materials Needed: Student Worksheet 3, Bonus Worksheet 3

DIRECTIONS:

1. Students need to know that percents, like fractions and decimals, are another way of expressing portions of a whole.
2. Remind students that percent literally means "out of 100." So 20%, for example, is 20 out of 100 or 20/100 or 1/5. To convert a percent to a fraction, put the percent over 100 and simplify the fraction.
3. Tell students that to convert a percent to a decimal, move the decimal point two places to the left. Since percents are in the hundredths, you need to divide the percent by 100, which is the equivalent of moving the decimal point in the percent two places to the left. For example, 20% = 20 ÷ 100 = 0.2.
4. Percents are often used to express part of the whole. For example, 35% of 400 people surveyed said they like rock music. How many people like rock music? In a simple math formula, the equation would be calculated as 0.35 x 400 = 140. To understand in terms of a proportion, the set up is $35/100 = x/400$. Students know that 35 out of every 100 like rock music. Since 400 is 4 times greater than 100, the number that like rock is 4 x 35 or 140.
5. Students can also use proportions to calculate percents. For example, if 450 students out of 1,000 own a portable MP3 player, what percent of students own MP3 players? To get a percent, the goal is to arrive at a ratio with 100 as the denominator. Set up a proportion equation where $450/1000 = x/100$. $x = 45$ or 45%.
6. Distribute **Student Worksheet 3**. Read the first paragraph aloud to your class and have students complete the problems. Explain to students that percents are used here to understand a budget, and a budget is a useful tool for students to use in tracking their own income and expenses. Tell students that using proportions and ratios can help solve many of the questions. Have students read their answers aloud and go over the correct answers using the **Worksheet Answer Key** (see back cover).
7. Once you've reviewed this activity in class, you may want to distribute **Bonus Worksheet 3**, which shows how percents can be used in problems regarding time and money. The bonus activity also explains the concept of greater than 100%.

Real-World Math Extensions:

- Ask students if they can think of professions that involve math. Discuss with students what an *actuary* is. Actuaries use statistics in their job to calculate risks for many different industries, and they look at data in terms of fractions, decimals, and percents. If you ever take an exam to become an actuary, you'll see that the test is full of fractions, decimals, and percents. Actuaries also use ratios and proportions in predicting likelihood of events. For example, by analyzing past experience, an insurance company believes that 1 in every 20 drivers will have an accident in a given year. If they insure 10,000 drivers this year, the insurance company can put aside money to pay for 500 accidents. The proportion is 1/20 = 500/10,000.
- The *Series of Unfortunate Events* books contain types of events actuaries may estimate the likelihood of occurring. For example, they may find that 1/3 of all skiers have accidents. Or that 40% of all skydivers injure their feet. Or 0.20 of all residents in a Kansas town have experienced tornado damage. Can you think of other events actuaries may analyze?

STUDENT WORKSHEET 1

Name: _____ Date: _____

Stardom: *Just a Fraction Away*

The Conversions are a young band featuring Nikki, Dezzy, and Bailey. They also have a manager, Ralph, who works for them booking shows. The Conversions have been touring the country, selling CDs, and gaining more screaming fans who want to hear their hit, "We're Together, Even Though We're 'A Part.' " But they still return home every month to rehearse in Nikki's parents' garage.

Nikki, the guitarist, is far into fractions. In fact, his bandmates have nicknamed him "Nikki Sixth." Complete the questions below to see how Nikki uses fractions to help the band divide up everything from pizza to profits. Refer to the Work Tips box for pointers to help solve the problems.

WORK THE MATH

1. Nikki knows that the three main players and their manager, Ralph, all contribute equally to making the whole band a success. In the space below, write an equation using fractions to show how these 4 contribute equally:

Now, express your equation in decimals and then in percents:

2. After rehearsals in Nikki's parents' garage, the 3 players always chow down on pizza. The band has a wide range of tastes, so they always order "The Extreme Pie." This pizza has 16 slices: 8 slices are pepperoni, 4 slices are sausage, 2 are onion, 1 has broccoli, and 1 is cheese only. In the chart below, express the different toppings on the left as a fraction, and then reduce it to its simplest form. Next, convert each fraction to its equivalent decimal and percent.

	Fraction	Decimal	Percent
Pepperoni			
Sausage			
Onion			
Broccoli or Cheese Only			
Pepperoni and Sausage			
Onion and Broccoli			

3. The band currently has a hot new CD called *Extreme Pie*, named after their favorite pizza. The CD currently costs $16. Take a look at the chart below that shows how money from each CD sale is divided up among those who contributed to the CD. In the first column, write down each contributor's amount as a fraction, and reduce each fraction to its simplest form. Then express each fraction as a decimal and a percent.

	Fraction	Decimal	Percent
Band: $6			
Record Label: $4			
Record Store: $3			
Producer: $2			
Manager Ralph: $1			
Total: $16			

WORK TIPS

- **To convert a fraction to an equivalent decimal, divide the numerator (the top number of a fraction) by the denominator (the bottom number of a fraction).**
- **To convert a fraction to an equivalent percent, calculate the decimal then multiply it by 100, moving the decimal point two places to the right.**

BONUS: The band is getting more popular, so the label is now going to increase the cost of its album to $20 each. All parties will get the same fraction of the whole as before. The Conversions are happy because they'll be getting more profit.

Using ratios and proportions, calculate how much The Conversions will now get from each album. For example, if the record label now gets 1/4 of $20, the proportion is 1/4 = 5/20.

Name: _____ Date: _____

Rock to the Top *with Decimals*

Dezzy, the drummer for The Conversions, digs decimals. He often uses decimals to figure out band logistics and to calculate all the band's travel questions. Also, he uses decimals to handle the band's growing database of fans. Complete the questions below to see how decimals can help you understand logistical questions.

WORK THE MATH

1. The Conversions travel in a van with 10 seats. 3 seats are for the band. 1 is for Ralph, the manager. 2 seats are for the band's dogs—a pointer and a dachshund. 4 seats are for friends. In the chart below, express the seating in decimals, knowing that the number following a decimal point represents tenths. Then, convert the decimals into fractions. (Say each decimal out loud in terms of tenths.) Reduce each fraction to its simplest form. Finally, convert the decimals into percents.

	Decimal	Fraction	Percent
Band seats:			
Ralph's seat:			
Dog seats:			
Friend seats:			
Total: 10 seats			

2. The Conversions often play concerts in 100-seat venues. They usually reserve 22 seats for ticket giveaways, 12 seats for friends who wear "Extreme Pie" T-shirts, while the rest are for sale. In the space below, write the tally down in terms of decimals. Convert each decimal into a fraction by saying each decimal aloud in terms of hundredths and reducing it to its simplest form. Then, convert the decimals into percents.

	Decimal	Fraction	Percent
Giveaways:			
Friends:			
Tickets for sale:			

3. Dezzy maintains the band's mailing list of 1,000 e-mail addresses. 125 are radio deejays. 248 are out-of-town fans. 627 are local fans. Dezzy writes down the tally in terms of decimals. In column 1 below, express each group as a decimal. Next, in column 2, convert the decimals into fractions. Say each aloud in terms of thousandths and reduce to its simplest form. Finally, convert the decimals into percents. Move the decimal point two places to the right.

	Decimal	Fraction	Percent
Deejays:			
Out-of-town fans:			
Local fans:			

WORK TIPS

- **To convert a decimal to a fraction, say the decimal aloud and simplify.**
- **To convert a decimal to a percent, move the decimal two places to the right. A percent means "out of 100," so by moving the decimal point two places to the right you are multiplying the decimal by 100 to arrive at the percent.**

BONUS: Dezzy recently sent out an e-mail to all 1,000 people on their mailing list advertising that the band had CDs, T-shirts, and socks for sale. 0.2 of the list responded wanting CDs, 0.05 wanted T-shirts, and 0.001 wanted socks. Express the following answers as numbers and as conversions into percents and fractions.

a. How many people wanted CDs? (0.2 of the list)?

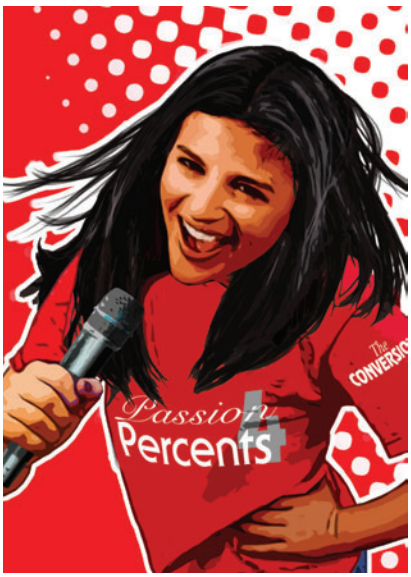
b. How many people wanted T-shirts? (0.05 of the list)?

c. How many people wanted socks? (0.001 of the list)

Name: _____ Date: _____

Show Me the Money *with Percents*

One of the reasons that the young band The Conversions is going to be successful is because the group understands how to use a budget to manage its money. Bailey, the lead singer, is in charge of the band's budget. She has a passion for percents because they help her understand how much money is coming in (*income*) and how much money is being spent (*expenses*). The band has even nicknamed her "Bailey 100" because *percent* literally means "per hundred." Study the budget chart below and answer the questions to see how well the band is budgeting. Use the Work Tips to help you with your answers.



WORK THE MATH

1. Bailey tracks every penny of the band's income and expenses for an average month. She uses percents to see how money is earned and spent. Once you figure out the percents, complete the budget chart by converting them into decimals and fractions. (*Tip:* You can think of income amounts as *positive* values and expense amounts as *negative* values.)

The Band's Average Monthly Budget

INCOME	Per Month	Percent	Decimal	Fraction
Shows	$250			
CD Sales	$100			
T-Shirt Sales	$50			
Total	$400			
EXPENSES	**Per Month**	**Percent**	**Decimal**	**Fraction**
Rehearsal Room	−$100			
Equipment and Insurance	−$60			
Touring Van (gas/repairs)	−$65			
Publicity (posters, etc.)	−$25			
Total	−$250			

2. The band is earning more than it is spending. The amount of income beyond expenses is called *profit*. How much profit does the band make on average per month?

3. What part of the band's income is profit? Express as a percent, decimal, and fraction.

4. The band donates 25% of its profits to its favorite charity: orphaned monkeys. They put the remaining 75% into a savings account. How much money is the band currently sending to orphaned monkeys? How much does the band put into savings each month?

5. One month, the band's income changed so that 37.5% of its income came from gigs and 25% came from CD sales. What fraction of the band's income came from T-shirt sales that month? Also, express the answer as a decimal.

WORK TIPS

- **To convert a percent to a decimal, move the decimal point two places to the left. Since percents are in the hundredths, you need to divide the percent by 100, which is the equivalent of moving the decimal point two places to the left.**
- **To convert a percent to a fraction put the percent over 100 and simplify the fraction.**
- **Percents can be greater than 100% to show when something is greater than the whole.**
- **Some percents require an infinity sign over the final digit. For example: 1/3 = 33.$\overline{3}$%.**

BONUS: The band has an extra show performing in a high school gym one month and earns $50 more than usual. What percent of their total income came from shows that month?

WORKSHEET ANSWER KEY

Student Worksheet 1: Stardom: Just a Fraction Away

1. 1/4 + 1/4 + 1/4 + 1/4 = 1
0.25 + 0.25 + 0.25 + 0.25 = 1
25% + 25% + 25% + 25% = 100%

2.

	Fraction	Decimal	Percent
Pepperoni	8/16 or 1/2	0.5	50%
Sausage	4/16 or 1/4	0.25	25%
Onion	2/16 or 1/8	0.125	12.5%
Broccoli or Cheese Only	1/16	0.0625	6.25%
Pepperoni and Sausage	12/16 or 3/4	0.75	75%
Onion and Broccoli	3/16	0.1875	18.75%

3.

	Fraction	Decimal	Percent
Band: $6	6/16 or 3/8	0.375	37.5%
Record Label: $4	4/16 or 1/4	0.25	25%
Record Store: $3	3/16	0.1875	18.75%
Producer: $2	2/16 or 1/8	0.125	12.5%
Manager Ralph: $1	1/16	0.0625	6.25%
Total: $16	16/16 or 1	1.00	100%

BONUS: The band is now getting 3/8 of $20 or $7.50.

Bonus Worksheet 1: Ratio Radio

1. To figure out how many songs of each type of song The Conversions should play in an hour-long set, students need to set up a proportion with each ratio (or fraction) in the Ratio Radio chart.

	Songs Per Hour	Fraction	Decimal	Percent
Fast Rock:	144/24 = x/1 or 6	1/2	0.5	50%
Slow Rock:	72/24 = x/1 or 3	1/4	0.25	25%
Rap:	48/24 = x/1 or 2	1/6	$0.16\overline{6}$	$16.\overline{6}\%$
Country Crossover:	24/24 = x/1 or 1	1/12	$0.08\overline{3}$	$8.\overline{3}\%$

2. 5 minutes

3. 40 ÷ 5 = 8. (8 additional songs.)

4. 4 fast and 2 slow

Student Worksheet 2: Rock to the Top with Decimals

1.

	Decimal	Fraction	Percent
Band seats:	0.3	3/10	30%
Ralph's seat:	0.1	1/10	10%
Dog seats	0.2	2/10 or 1/5	20%
Friend seats:	0.4	4/10 or 2/5	40%
Total: 10 seats	1.0	10/10 or 1/1	100%

2.

	Decimal	Fraction	Percent
Giveaways:	0.22	22/100 or 11/50	22%
Friends:	0.12	12/100 or 3/25	12%
Tickets for sale:	0.66	66/100 or 33/50	66%

3.

	Decimal	Fraction	Percent
Deejays:	0.125	125/1000 or 1/8	12.5%
Out-of-town fans:	0.248	248/1000 or 31/125	24.8%
Local fans:	0.627	627/1000	62.7%

BONUS: **a.** 200 people: 20%; 2/10 or 1/5
b. 50 people: 5%; 5/100 or 1/20
c. 1 person: 0.1%; 1/1000

Bonus Worksheet 2: Driving with Decimals/Mapping with Proportions

1. 1.0/100 = 2.1/x. 100 x 2.1 = 210 miles.

2. 1.0/100 = 0.9/x. 100 x 0.9 = 90 miles.

3. 1.0/100 = 1.8/x. 100 x 1.8 = 180 miles.

4. To figure out how many hours it takes between cities at 60 mph, divide the total number of miles in questions 1–3 by 60.
New York to Boston: 3.5 hours (210/60)
Boston to Hartford: 1.5 hours (90/60)
Hartford to Philadelphia: 3 hours (180/60)

Extra Bonus: 1/1.02 = x/800. x = $784.

(continued on back cover)

WORKSHEET ANSWER KEY (continued from previous page)

Student Worksheet 3: Show Me the Money with Percents

1. The Band's Average Monthly Budget

INCOME	Per Month	Percent	Decimal	Fraction
Shows	**$250**	62.5%	0.625	250/400 or 5/8
CD Sales	**$100**	25%	0.25	100/400 or 1/4
T-Shirt Sales	**$50**	12.5%	0.125	50/400 or 1/8
Total	**$400**	100%	1.000	400/400 or 1/1

EXPENSES	Per Month	Percent	Decimal	Fraction
Rehearsal Room	**–$100**	40%	0.40	100/250 or 2/5
Equipment and Insurance	**–$60**	24%	0.24	60/250 or 6/25
Touring Van (gas/repairs)	**–$65**	26%	0.26	65/250 or 13/50
Publicity (posters, etc.)	**–$25**	10%	0.10	25/250 or 1/10
Total	**–$250**	100%	1.00	250/250 or 1/1

2. $400 – $250 = $150

3. $150 is 37.5% of $400; 0.375; 150/400 or 3/8

4. Money for monkeys: $150 x 0.25 = $37.50
Money for savings: $112.50

5. The answer is to convert 37.5% to 3/8. Also, express the answer as a decimal: 0.375.

BONUS: Income from shows becomes $300. Total income becomes $450. 300/450 = 2/3 or $0.6\bar{6}$ or $66.\bar{6}$%.

Bonus Worksheet 3: Time and Money—It's a Matter of Math

1. 40%; 0.40; 2/5

2. 60%; 0.60; 3/5

3. 12.5%; 0.125; 1/8

4. A full house would mean 100% full. The proportion is 42/70 (or 6/10) = x/100. The answer is 60 people. If the house is 105% full, then the proportion is 100/60 (or 5/3) = 105/x. The answer is 63 people. A more simple solution is 1.05 x 60 = 63.

Alignment with NCTM Standards

	Lesson 1	Lesson 2	Lesson 3
Numbers and Operations			
Work flexibly with fractions, decimals, and percents to solve problems.	✔	✔	✔
Compare and order fractions, decimals, and percents efficiently.	✔	✔	✔
Develop meaning for percents greater than 100.			✔
Understand and use ratios to represent quantitative relationships.	✔	✔	✔
Understand the meaning and effects of arithmetic operations with fractions, decimals, and integers.	✔	✔	✔
Use the associative and commutative properties of addition and multiplication and the distributive property of multiplication over addition to simplify computations with integers, fractions, and decimals.	✔	✔	✔
Select appropriate methods and tools for computing with fractions and decimals from among mental computation, estimation, calculators or computers, and paper and pencil, depending on the situation, and apply selected methods.	✔	✔	✔
Develop and use strategies to estimate the results of rational-number computations and judge the reasonableness of the results.	✔	✔	✔
Develop, analyze, and explain methods for solving problems involving proportions, such as scaling and finding equivalent ratios.	✔	✔	✔
Measurement			
Use common benchmarks to select appropriate methods for measurements.		✔	
Solve problems involving scale factors, using ratio and proportion.		✔	