Preparation 1.4-W
Affordable Care Act

(1) Match the fractions to their equivalent percent form (rounded to the nearest percent).

(a) $\frac{1}{5}$	(i) 10%
(b) $\frac{2}{3}$	(ii) 20%
(c) $\frac{3}{4}$	(iii) 25%
(d) $\frac{1}{2}$	(iv) 33%
(e) $\frac{1}{3}$	(v) 50%
(f) $\frac{1}{4}$	(vi) 67%
(g) $\frac{1}{10}$	(vii) 75%

(2) In Exercise 1.1, you used a place-value chart for place values greater than one. Place value also extends to the right of the decimal to represent numbers less than one.

(a) Complete the missing names in the chart below.

Hundred thousands
Ten thousands
Thousands
Hundreds
Tens
Ones
Tenths
(i)
(ii)
(iii)
Hundred thousandths

(b) What is the name in words for the number 0.035?

(c) What is the name in words for the percent 0.02%?

(3) Round 54,927.2382 to the specified place value.

(a) Hundredths

(b) Hundreds

(c) Tens

(d) Thousands

(e) Tenths

(f) Thousandths

(4) Convert each fraction to a decimal. Round to the nearest thousandth.

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

(b) $\frac{12}{7}$

(c) $\frac{25}{3}$

(d) $\frac{25}{6}$

(e) $\frac{254}{100}$

(f) $\frac{6}{25}$

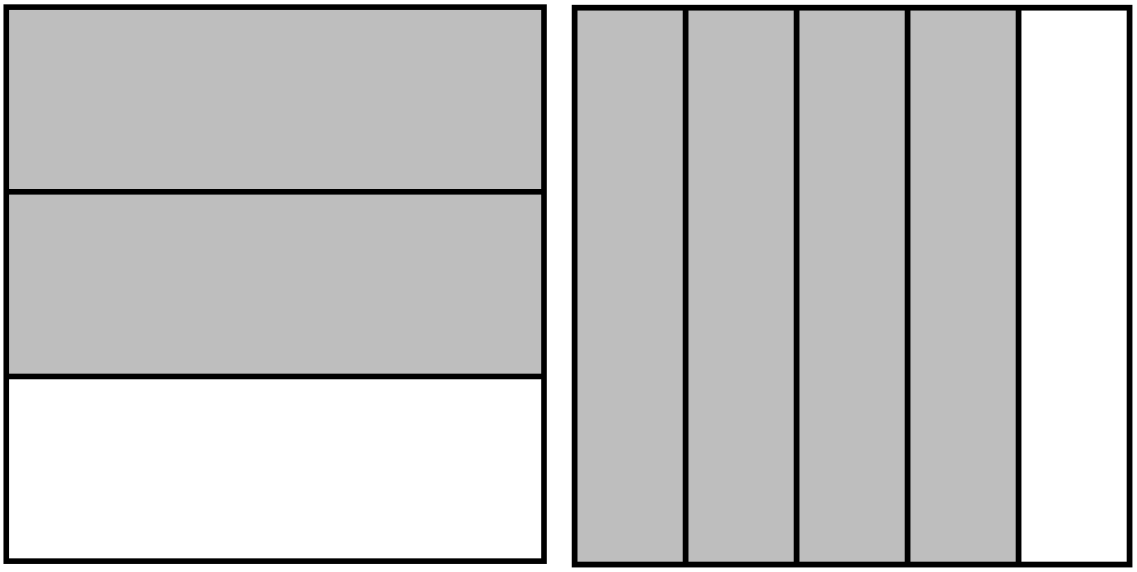
(5) Collaboration 1.4 focuses on skills needed to be a "flexible quantitative thinker." One of these skills is recognizing when calculations can be done in different ways. In the following question, you will be asked if two number expressions are *equivalent*. A **number expression** is a statement that uses numbers and operations, such as 3 + 4. An equivalent number expression is indicated by an equal sign (=), such as 3 + 4 = 7. Also note 3 + 4 is equivalent to 4 + 3 because it does not matter in what order you add the numbers.

Complete the table by marking whether the first and second expressions are equivalent.

First Expression	Second Expression	Equivalent? Yes/No
5×7	7×5	*(a)*
$8 - 4$	$4 - 8$	*(b)*
$10 \div 2$	$2 \div 10$	*(c)*
$20 \div 2$	$20 \times \frac{1}{2}$	*(d)*

Multiplying Fractions

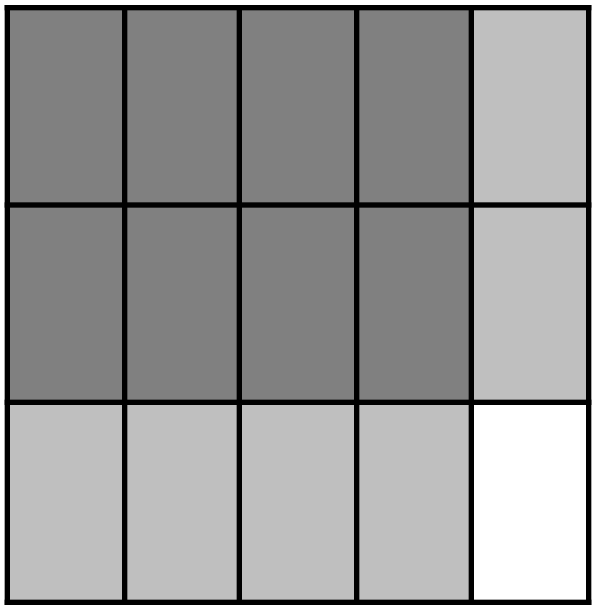
You can think of multiplying fractions in terms of area. Look at the squares below.



The square on the left is divided into thirds. Two of the thirds are shaded gray, that is, the shaded part is $\frac{2}{3}$ of the whole square.

The square on the right is divided into fifths. Four of the fifths are shaded gray, that is, the shaded part is $\frac{4}{5}$ of the whole square.

Now, see what happens when we overlap the two squares.



The region that is shaded twice is darker than the rest. The dark gray area represents the product $\frac{2}{3} \times \frac{4}{5}$.

Notice that the square is now divided into 15 regions (15 = 3 × 5), and the number of those regions that are dark gray is 8 (8 = 2 × 4). So 8 out of 15 pieces of the square are dark gray, or $\frac{8}{15}$.

Recall the rule for multiplying fractions: Multiply the numerators (2 × 4); multiply the denominators (3 × 5); then simplify if possible. Therefore, $\frac{2}{3} \times \frac{4}{5} = \frac{8}{15}$.

(6) Multiply the following fractions. Write your answer in simplified form.

(a) $\frac{3}{4} \times \frac{2}{5} =$

(b) $\frac{1}{8} \times \frac{3}{4} =$

(7) The United States government offers many different programs for people living in the U.S. These programs provide aid for people living in poverty. The "Federal Poverty Line", or FPL for short, is a measure that determines who qualifies to receive this aid.

The "Federal Poverty Line" (FPL) is a minimum amount of income a person needs for basic necessities. Some basic necessities are food, clothing, transportation, and shelter. The government calculates this measure by looking at how much an individual person or family would need for these basic necessities.

Household size (how many people live in a home) helps the government set the rate for the federal poverty line. The Federal Poverty Line rate is adjusted each year. The Federal Poverty Line also uses information about the amount of income that people in a household earn each year.

In the United States, the FPL is used to determine if an individual or family is eligible for services. These services include health care coverage or assistance with the cost of housing. The government analyzes household income in terms of percentage of the federal poverty line. Here are some examples:

- For 2014, the federal poverty line for a household of two is $15,730 per year.
- A household of two making 100% of the poverty line has an income of $15,730.
- A household of two making 200% of the poverty line has an income of $31,460.

Using the information about households and the federal poverty line above, answer the following questions.

(a) What is the yearly household income that is 300% of the poverty line?

(b) What is yearly household income that is 400% of the poverty line?

(8) Many people have difficulties knowing how the Affordable Care Act, also known as Obamacare, affects them. Low-income families, in particular, do not know how much financial aid they can get to help pay for healthcare coverage. Today you will learn how to help them!

In 2013, approximately 46 million U.S. citizens did not have health insurance. This was about 15% of the U.S. population. Without health insurance, a person who gets seriously ill or injured may not be able to afford the health care he or she needs to get better. The person may go into serious debt to pay medical expenses.

The Affordable Care Act, also known as Obamacare, was created to restructure America's health care system. Obamacare requires that most Americans have health insurance by 2014. By 2015, the law requires that businesses with 50 or more employees must offer health coverage to employees. Individuals and businesses that do not meet these requirements risk having to pay a fine.

The way individuals and businesses get health coverage is to join the new Health Insurance Marketplace (Marketplace). The Marketplace is a place where individuals can find health care coverage from private companies. The federal and state governments run different websites for the Marketplace.[1]

Watch this video about "Obamacare" in preparation for the next lesson on the Affordable Care Act:
https://carnegiemathpathways.org/go/ytobamacare

What do you know from this video, the media or personal experience about the Affordable Care Act, or health care coverage in general?

After Preparation 1.4 (survey)

You should be able to do the following things for the next class. Rate how confident you are on a scale of 1–5 (1 = not confident and 5 = very confident).

Before beginning Collaboration 1.4, you should understand the concepts and demonstrate the skills listed below.

Skill or Concept: I can …	**Rating from 1 to 5**
recognize common fraction benchmarks and equivalent percent forms.	
round a whole number to a given place value.	
perform calculations using a calculator.	
understand the relationship of multiplication and division (dividing by 3 is the same as multiplying by 1/3).	
convert between a fraction and its decimal form.	
multiply fractions.	

[1] https://www.healthcare.gov/do-i-qualify-for-medicaid/

1.4-C: Affordable Care Act Health Care

INTRODUCTION

Comprehension and Synthesis (CaS) Charts

You may consider using the Comprehension and Synthesis (CaS) Chart in this collaboration and in future collaborations. Remember, using the CaS Chart can help you have a deeper understanding of the problem situation. CaS Charts can help you understand the main issue(s) that need(s) to be resolved and will help you to recognize the quantitative information that is available in the problem situation that can help you to solve the problem. You can use CaS Charts in some of the Quantway collaborations to "unpack" problem situations and support problem-solving. First, on your own, recall the steps for completing the CaS Chart below. As you read the problem situation, you may complete the CaS Chart to supplement your thinking.

As you are reading a Problem Situation:

- Complete Column A: What issues in the problem situation do you need to understand in order to solve the problem? Is there contextual information that you need to know in order to understand the problem situation?
- Complete Column B: What quantitative information is provided in the problem situation that will help you solve the problem? Hint: Quantitative information is often a number, but also could be a number word, like "two".
- Complete Column C: It is not necessary to solve the problem or use calculations right now. In this column, brainstorm ways you might address the issues presented in the problem situation (Column A) using the quantitative information in Column B. There are no wrong answers.

Column A	Column B	Column C
What is/are the main issue(s) in this problem situation?	**What is the key quantitative information you need to solve the issue(s) in the problem situation?**	**Describe in writing how the information in Column B will help you address the issue(s) in Column A later in the lesson.**

SPECIFIC OBJECTIVES

By the end of this collaboration, you should understand that

- flexibility with calculations is an important quantitative skill.
- different methods of calculation are often possible and helpful.

By the end of this collaboration, you should be able to

- write a calculation in at least two different ways based on
  - equivalent forms of fractions/decimals/percentages.
  - relation of multiplication and division.
  - the *Commutative Property* (knowing when the order of numbers can be reversed, such as 3 + 4 = 4 + 3, but $3 - 4 \neq 4 - 3$).
  - order of operations.
  - the *Distributive Property* ($5(3 + 4) = 5 \times 3 + 5 \times 4$).

SPECIFIC LANGUAGE AND LITERACY OBJECTIVES

By the end of this collaboration, you should be able to

- read and comprehend the problem situation and "Premium Contribution" chart.
- complete the CaS Chart with quantitative and health care information from the problem situation about the Affordable Care Act.
- demonstrate an understanding of mathematics by writing complete and correct responses to questions.
- demonstrate the ability to describe, analyze, and synthesize information about the Affordable Care Act.
- use appropriate quantitative and health care vocabulary to discuss mathematics in this lesson.

PROBLEM SITUATION 1: THE AFFORDABLE CARE ACT

In preparing for this collaboration, you learned about the Affordable Care Act and the Marketplace. The government offers financial aid to low-income individuals and families who enroll in the Marketplace. The amount of aid depends on many factors such as income, family size, age, and location. Federal poverty lines (FPL) are used to see if an individual or family qualifies for aid when buying insurance through the Marketplace.

The problem for many individuals and families is figuring out how much health care coverage will cost. The federal poverty line in 2014 was $11,670 for an individual, and $23,850 for a family of four.[2] Individuals and families making 100-400% of the poverty line are considered "low-income". The government uses this information to figure out how much a family can pay for health care coverage.

The government offers financial assistance to cover part of health care costs. How much the government covers depends on how much money an individual or family can pay from their own income (the amount

[2] Based on 2014 numbers.

the family pays is commonly called an out-of-pocket expense). The government offers financial assistance to cover the rest of the cost of health care coverage beyond what the family or individual pays out-of-pocket.

For example, imagine a household income is between 100% and 133% of the federal poverty line. That individual or family would not have to pay more than 2% of their annual income to cover their health insurance costs. In this situation, a family would pay 2% of their income as an out-of-pocket expense for health care coverage. The government would pay for the remaining cost of coverage through a tax credit.

The table below summarizes expected contributions for the health care cost for a family of four in 2014. The information is listed for families having an income between 100% and 400% of the poverty line. An individual or family making more than 400% of the federal poverty line would not be eligible for financial aid from the government.

A premium is the amount of money a family or individual pays per month for insurance.[3] The problem is that many low-income families are having trouble understanding how to calculate the cost of health care coverage under the Affordable Care Act. The purpose of this collaboration is to explore this problem.

Figure 1: Premium Contribution by Income under the Health Care Reform for a Family of Four[4]

Percentage of Poverty Line	Premium Contribution as Percentage of Income
100-133%	2%
133-150%	3-4%
150-200%	4-6.3%
200-250%	6.3-8.1%
250-300%	8.1-9.5%
300-350%	9.5%
350-400%	9.5%

(1) What are the factors that determine how much money low-income individuals or families will pay for health care coverage? Brainstorm possible answers with your group. Write your answer in **1-2 complete sentences**. (It is important to write complete sentences because it helps your instructor better understand your mathematical thinking.)

[3] http://www.cbpp.org/files/QA-on-Premium-Credits.pdf.
[4] http://www.cbpp.org/sites/default/files/atoms/files/QA-on-Premium-Credits.pdf

(2) **Estimate** the income of an individual who has a yearly income that is 150% of the poverty line. Try to do the estimation without writing it down or using a calculator if you can. Explain your strategy for your estimation. (It is okay if people in your group use different strategies, and for your estimations to be different).

Performing Calculations in Multiple Ways

The ability to solve problems in multiple ways is an important quantitative reasoning skill. Today's lesson asks you to brainstorm different ways to find the answer to a question. Different strategies are often useful in different situations.

You saw in a previous collaboration that estimation strategies often depend on specific numbers. This can also be true in calculations. Sometimes changing the order of operations or grouping operations can be helpful. It is important to know when you can make changes (that is, which changes are okay because you will still be able to make the correct calculations after making the changes).

(3) How would you write a mathematical expression to find the exact income that is 150% of the poverty line? (**Hint**: 2.5 x 130 is an example of a mathematical expression.) Try to find as many different mathematical expressions as possible. Input your expression into your calculator to find this income.

(4) William, Vanessa, and their two children have a yearly income of $31,200. Help this family understand their expected **monthly health care costs**.

(a) Calculate this family's income as a percentage of the poverty line. Remember, the poverty line for a family of four is $23,850.

(b) Calculate the maximum amount of money this family would have to spend on health care coverage **per month**.

PROBLEM SITUATION 2: THE AFFORDABLE CARE ACT AND MONTHLY COSTS OF HEALTH CARE COVERAGE

Families have options when selecting a plan in the Marketplace. There are five categories of plans that determine health care coverage costs: Catastrophic, Bronze, Silver, Gold, and Platinum. The Silver Plan is considered the standard plan. Individuals or families that have a yearly income between 100% to 400% of the poverty line are considered low or moderate income. These families will receive financial assistance from the government to cover additional insurance costs. The amount of this financial assistance is calculated by finding the difference between the cost of the standard plan (the Silver Plan) and the individual or family's expected cost for health care coverage.[5] If you buy the gold plan, you have to pay the additional cost since the government does not pay more.

(5) Let's return to William, Vanessa, and their two children. In their community, the total yearly cost of the standard plan for this particular family is $11,064. Imagine that William and Vanessa have decided to enroll their family in this plan. Write a mathematical expression that can be used to calculate how much this family will receive in the form of government monthly aid to cover insurance.

(6) Write **1-2 sentences** explaining the amount of money that William and Vanessa would have to spend for health care coverage under the Affordable Care Act. **Write complete sentences and include this information in your answer:** the amount of money William and Vanessa pay for health care coverage each month, and how much they receive as aid from the government per month.

[5] https://www.healthcare.gov/how-do-i-choose-marketplace-insurance/.

(7) William and Vanessa's family have the following average monthly expenses. Calculate how much the family should expect to spend in **one year**.

Rent	$1,250
Utilities	$200
Food	$400
Health Care	$52
Total	

(8) William and Vanessa have neighbors who are trying to figure out which health care plan is best for them. The Aziz family is a family of four, with a household income of $72,000. This family is interested in the standard plan that costs $11,064 per year.

(a) What is the maximum percentage of the Aziz's household income that would have to go toward health care coverage?

(b) Calculate the maximum amount of money the Aziz family would have to spend on health care coverage per month.

(c) If the Aziz family chooses the same standard as William and Vanessa, what is the monthly aid from the government that this family will receive to help cover insurance costs?

MAKING CONNECTIONS

Record the important mathematical ideas from the discussion.

Exercise 1.4 (Workforce)
Affordable Care Act

MAKING CONNECTIONS TO THE COLLABORATION

(1) Which of the following was one of the main *mathematical* ideas of the collaboration?

(i) You can change a calculation in any way that you think will make it easier to do.

(ii) Calculations can often be performed in different ways based on mathematical rules.

(iii) Multiplying by 2/3 is the same as multiplying by 2 and then dividing by 3.

(iv) The new Affordable Care Act would allow families with income up to 400% of the poverty line to receive government aid to cover their health care cost.

DEVELOPING SKILLS AND UNDERSTANDING

In Collaboration 1.4, you used several important mathematical rules and relationships to perform calculations in different ways. Those rules are summarized for you here so you can refer back to them. The rules also have formal names. You do not have to memorize these names for this course, but you may use them in other math classes. If you want more help with any of the rules, use their formal names to find resources on the Internet.

Mathematical rules are defined in terms of **variables**. The variables are symbols, usually letters that represent numbers. You use variables to show that the rule can apply to multiple numbers. This is called **generalizing** because it shows that a rule can be used in *general* and not just in specific cases. The mathematical rules below are shown using both variables and numbers.

While mathematical rules are very important, in this course the authors emphasize *reasoning* over memorizing rules. As you review the rules, try to make sense of the rules so that they will become a part of your thinking.

Commutative Property

The **Commutative Property** states that the order of addition and multiplication can be changed.

General Rule	Example
$a + b = b + a$	$8 + 3 = 3 + 8$
$a \times b = b \times a$	$5 \times 6 = 6 \times 5$

Note: It is important to remember that the Commutative Property does not apply to subtraction and division.

Order of Operations

The **order of operations** defines the order in which operations are performed.

General Rule	Example
1. Operations within grouping symbols, innermost first. Grouping symbols include: • Parentheses ( ) • Brackets [ ] • Fraction Bar – the line between the top number and the bottom number in a fraction as shown to the right 	$15 + [12 - (3 + 2)] - 2 \times 3^2 \div 6$ $15 + [12 - (5)] - 2 \times 3^2 \div 6$ $15 + [7] - 2 \times 3^2 \div 6$
2. Exponents	$15 + [7] - 2 \times 9 \div 6$
3. Multiplication and division, left to right	$15 + [7] - 18 \div 6$ $15 + [7] - 3$
4. Addition and subtraction, left to right	$22 - 3$ 19

Distributive Property

The **Distributive Property** general rule can be written as:

$$a\,(b + c) = a \times b + a \times c$$

Note about subtraction: Subtraction is related to addition. The Distributive Property is shown using addition, but it also works with subtraction, such as $8\,(5 - 1) = 8 \times 5 - 8 \times 1$.

Notation: The operation of multiplication is shown in many ways. You have already seen the use of the multiplication symbol (×). Another way to indicate multiplication is a number or variable in front of parentheses with no other symbol. For example $6(2) = 6 \times 2$, or $a(b) = a \times b$. You will learn other symbols for multiplication later in the course.

The Distributive Property is easiest to understand by looking at examples.

Example: $4\,(3 + 1) = 4 \times 3 + 4 \times 1$.

To demonstrate that these two calculations are equivalent, each side is done separately.

Left side: Using order of operations, the operation inside the parentheses is done first.

$$4\,(3 + 1)$$
$$4\,(4)$$
$$16$$

Right side: Using the Distributive Property, the multiplication is *distributed* over the addition.

$$4\,(3 + 1)$$
$$4 \times 3 + 4 \times 1$$

Order of operations tells you to multiply first.

$$12 + 4$$

Division

Division is the same as multiplication by the **reciprocal**. You get the reciprocal of a number when you write the number as a fraction and reverse the numerator (the top number) and the denominator (bottom number).

General Rule	Example
$a \div b = a \times \frac{1}{b}$	$15 \div 5 = 15 \times \frac{1}{5}$
$a \div \frac{b}{c} = a \times \frac{c}{b}$	$10 \div \frac{3}{5} = 10 \times \frac{5}{3}$

(2) In Collaboration 1.4, you saw that there was a relationship between multiplication and division. Refer back to this work to complete the following statement. (Fill in the blank with a fraction.)

65,596 ÷ 4 is the same as 65,596 × _____.

(3) Using the concept from the previous question, fill in the blanks in the table below to create equivalent statements.

Multiplication	Division
$85 \times \frac{1}{5}$	(a) 85 ÷ ___
(b) 1.23 × ___	1.23 ÷ 7
(c) 1.23 × ___	$1.23 \div \frac{2}{3}$

(4) Which expressions are equivalent to $16 \times \frac{3}{4}$? There may be more than one correct answer.

(i) 16 × 3 ÷ 4

(ii) 16 ÷ 0.75

(iii) 3 × 16 ÷ 4

(iv) 3 ÷ 4 × 16

(v) 16 × 0.75

(vi) 16 ÷ 4 × 3

(vii) 0.75 × 16

(viii) 16 × 4 ÷ 3

(5) According to the Consumer Expenditure Survey, the average American household spent $6,599 on food in 2012. About two-fifths of that was spent on eating out at restaurants. Calculate two-fifths of $6,599.

(6) The Gomez family, a family of four, is considering two different healthcare plans: the standard "Silver Plan" or the Gold Plan.

In the standard plan, the Gomez family will need to pay $250 monthly for their portion of their healthcare coverage costs. The government will cover $650 per month no matter which plan they choose.

If the Gomez family decides to upgrade to the Gold Plan, they will pay an additional $340 per month. They are not sure of the yearly cost for the Gold Plan.

Calculate the yearly cost, including government aid, of the Gold Plan for the Gomez family.

Introduction to Spreadsheets

A spreadsheet is a computer program used to organize and analyze data. In the example below, Lisa has created a spreadsheet for her monthly budget. Data is entered into **cells**, like the boxes in a table. The cells are named by the letter of the column along the top and numbered rows down the side. **Note:** The cell that contains the word *income* is labeled as A2, not 2A.

	A	B
1	**Monthly Budget**	
2	Income	$1,677
3	Rent	$750
4	Utilities	$230
5	Food	$160
6	Insurance	$89
7	Gas for Car	$80

Use this spreadsheet to answer Questions 8–10.

(7) What is in Cell B4?

(8) What does the number in Cell B4 represent in Lisa's budget?

(i) The money she plans to spend on rent each month.

(ii) The money she plans to spend on utilities each month.

(iii) The money she plans to spend on food each month.

(iv) The money she plans to spend on insurance each month.

(v) The money she plans to spend on gas for her car each month.

Formulas and Spreadsheets

Formulas are algebraic expressions that show important and non-changing relationships. They can be used to perform calculations in spreadsheets. The formulas use the cell name as a *variable* that represents the value in that cell. For example, in the spreadsheet above, the formula "=B3+B4" would result in the calculation $750 + $230, and "$980" would be displayed. Spreadsheets are a valuable tool because once a formula is written, the result will change when the values change. So if Lisa's rent increases, she can change the number in Cell B3 and the formula will calculate the new result(s) automatically.

(9) Lisa put the following formula in her spreadsheet:

$$= B2 - B3 - B4 - B5 - B6 - B7$$

(a) Calculate the result of this formula.

(b) What does this value represent for Lisa?

(i) The amount of money she expects to lose each month.

(ii) The amount of money she expects to have left after paying bills each month.

(iii) The percentage of her income that she will be able to save each month.

(iv) The value has no meaning for Lisa.

(c) Which of the following expressions would give the same result as Lisa's formula?

(i) = B2 – B3 + B4 + B5 + B6 + B7

(ii) = B2 – (B3 + B4 + B5 + B6 + B7)

(iii) = (B3 + B4 + B5 + B6 + B7) – B2

(iv) = B3 + B4 + B5 + B6 + B7 - B2

MAKING CONNECTIONS ACROSS THE COURSE

(10) Which of these expressions shows how to calculate 25% of 2,310? There may be more than one correct answer.

(i) 2,310 ÷ 4

(ii) 2,310 × 4

(iii) 2,310 ÷ 25

(iv) 2,310 × 25

(v) 2,310 × 0.25

(vi) 2,310 ÷ 0.25

(vii) $\frac{1}{4}$ × 2,310

(viii) $\frac{1}{4}$ ÷ 2,310

(ix) 0.25 × 2,310

(x) 0.25 ÷ 2,310

(11) Which expression is the same as 20% of a billion? There may be more than one correct answer.

(i) 0.2 × 1,000,000,000

(ii) 0.2 × 1,000,000

(iii) 10^9 ÷ 5

(iv) 10^9 ÷ 20

(v) 10^6 ÷ 5

(vi) One-fifth of 1,000 million

(vii) 20,000,000

(viii) 20 ÷ 100 × 1,000,000,000

Scientific Notation

In Exercise 1.3, you saw that a large number can be written as a number times a power of 10 in many different ways. For example, the number 124,000 can be written as 1.24×10^5 or 12.4×10^4. These different forms are all equivalent.

Scientific notation is a very specific way to write a large number as a power of 10. The purpose of scientific notation is to make it easier for people to use and communicate with large numbers. It would be confusing if two people working together on one project wrote the same number in two different ways. To avoid this, people decided that numbers in scientific notation would always be written in the same way: a number between 1 and 10 times a power of 10.

From the previous example:

- 1.24×10^5 is in scientific notation because 1.24 is a number between 1 and 10.
- 12.4×10^4 is not in scientific notation because 12.4 is larger than 10.

(12) Write 16,900,000 in scientific notation.

(13) Write 4,275,000,000 in scientific notation.

Self-Regulating Your Learning: The Plan Phase

At the start of this module, the authors briefly described what it means to be a "self-regulated learner." As you already learned, being a self-regulated learner involves going through three phases when you are working on a problem or an assignment. The phases are:

1. Plan
2. Work
3. Reflect

Let's look at what you should be doing during the ***plan*** phase. As you might imagine, the planning phase involves thinking about all the things you need to do to successfully complete a problem or assignment *before* you begin working on it. As was said previously, researchers who study how people learn found that experts often spend a lot more time planning how they are going to finish a task than they spend actually doing the task.

The planning phase involves several important aspects. The following are some that will be explored in this course:

- How much *confidence* you have that you can successfully complete the problem.
- The amount of *time and effort* you think it will take to understand and work on the problem.
- The *strategies* you might use to solve the problem.
- The *goals* you have as you try to work on the problem.

The authors will now describe each aspect in a little more detail. You will also continue to revisit them throughout the rest of the course.

Confidence: People who study how we learn have found that our beliefs regarding our ability to do a given task, like work on a particular math problem, often predicts how well we will actually do. Here is one way to think about it: If you really believe you can succeed at a problem, you are more likely to keep trying and keep working on that problem even if you get stuck. Because you invest more effort, you are more likely to be successful. On the other hand, if you look at a problem and immediately think "I cannot do this," then when you do get stuck or confused, you might be more likely to give up and not be successful. Researchers call your beliefs about your abilities your **self-efficacy**.

In this course, you will be asked to rate your self-efficacy on certain problems. If you rate yourself low, then you might want to allow more time to do that problem, plan to go get help, or try being more patient than you might normally be. Thinking about your confidence can help you plan your time and effort when you work on a problem or task.

Time and Effort: Obviously, some problems or assignments take more time than others. Some assignments require more effort than others. It can be frustrating to jump into an assignment thinking you can finish it easily or quickly only to discover it is harder or takes more time than you thought it would. You can avoid some or all of that frustration if you have a realistic idea of how hard the assignment will be. Also, having a good idea of how much time and effort will be needed helps you manage your time. For example, you might need to allocate time to discuss the assignment with your instructor, classmates, or tutors. For these reasons, approximating the time and effort needed *before* starting work on an assignment is a good planning tool.

Strategies: When you start working on a problem or assignment, you often have to try several different strategies before you find an approach that will help you complete it successfully. Sometimes, it is the first strategy you think of, but often it is not. If you think about possible strategies *before* you begin working, you immediately have another one to try if your first one does not work. Self-regulated learners think about many different possible strategies before trying to solve a problem.

Goals: Education researchers have shown that students who have **learning goals** are more likely to succeed than students who have what are called **performance goals**. If you have *learning goals*, you are trying to understand what you are learning and trying to make connections between ideas and concepts. If you have *performance goals*, you care most about finishing an assignment to get points or have it done; you are not focused on understanding the material. Self-regulated learners try to have learning goals more than performance goals. This helps them stay focused and motivated to learn when the problems are challenging. Good planning means making an effort to change your thinking so you have learning goals as often as possible.

In future collaborations and assignments, you will have opportunities to practice the planning ideas presented here. Before then, start incorporating the planning phase whenever you start an assignment. If you do, you will be better prepared and more likely to succeed.