

Adult Basic Education

## **Mathematics**

---

# **Mathematics 3107C**

## **Variation and Formulas**

### **Curriculum Guide**

**Prerequisites:** Mathematics 2105A, 2105B, 2105C  
Mathematics 3107A, 3107B

**Credit Value:** 1

**Mathematics Courses [General College Profile]**

Mathematics 2105A  
Mathematics 2105B  
Mathematics 2105C  
Mathematics 3107A  
Mathematics 3107B  
**Mathematics 3107C**  
Mathematics 3109A  
Mathematics 3109B  
Mathematics 3109C



## Table of Contents

To the Instructor .....	v
Introduction to Mathematics 3107C .....	v
Prerequisites .....	v
Textbook .....	v
Technology .....	vi
Curriculum Guides .....	vii
Study Guides .....	vii
Resources .....	viii
 Variation and Formulas .....	Page 2
 Appendix .....	Page 15



## To the Instructor

### **I. Introduction to Mathematics 3107C**

The primary goal of Variation and Formulas is to investigate four different types of variations. Students will learn how to recognize and establish a basic formula for each type of variation when given a graph, a table of values, or a description of the variation. They will also learn how to interpret graphs of various types of relations as well as manipulate and evaluate formulas.

### **II. Prerequisites**

Students should know how to apply the order of operations correctly in calculations. They should also know how to correctly plot a graph and be familiar with the various terms associated with a relation, such as *independent* and *dependent variables*. They should be familiar with these topics as they were the basis of one of the prerequisites for this course, Mathematics 3107B. Students should know how to change a percent to its decimal equivalent as well as know how to divide by a fraction. If necessary, the instructor should provide worksheets on these topics to ensure students have fully understood these concepts. Some worksheets are provided in the Appendix of this guide and are referenced in the *Suggestions for Assessment* column with the appropriate outcome(s).

### **III. Textbook**

*Essentials of Mathematics 12* is designed to emphasize the skills needed in adult life as well as in the workplace. Students should appreciate that mathematics is practical and useful for accomplishing real-world activities. With this in mind, this resource has been developed with contents that are real and relevant to the lives of students.

Each chapter begins with an introduction which presents the key mathematical ideas that will be encountered. The following categories are in each chapter:

**Chapter Goals:** Located on the bottom of each introductory page, this section lists the major concepts to be learned.

**Chapter Project and Project Activity:** Each chapter contains a guided project. This type of group work is not well suited for the Adult Basic Education environment. Therefore, **these sections have been omitted from the course.** However, if there are several students working on the same chapter, instructors may use their discretion in assigning the **Chapter Project**, or some modification of it, for an assessment.

## To the Instructor

**Exploration:** Most of the concepts are introduced, developed and explained in these lessons. In this section, **Examples** and **Solutions** for typical problems are provided. The instructor should ensure that students carefully study and understand each **Example** before proceeding.

**Class Discussion, Small Group Discussion and Pairs Activities:** As the titles imply, these activities are provided to give students an opportunity to work collaboratively. Some of these sections have been assigned in the Study Guide, especially if they can be completed by a student working alone.

**Mental Math:** The questions contained in these sections are often calculations that are similar to those required in the **Solutions** to the **Examples**. Although called **Mental Math**, students should not be required to complete these activities without pencil and paper. If students have difficulty with these problems, the instructor should provide practice worksheets. The solutions to **Mental Math** are found in the *Teacher Resource Book 12*.

**Notebook Assignment:** This section provides a series of problems similar to those in the **Exploration**. Students should attempt these problems only after the **Exploration** problems have been understood and all assigned **Mental Math** and practice worksheets have been completed. The textbook contains only answers to **Notebook Assignment**, but the *Teacher Resource Book 12* has solutions with workings and some explanations.

**Chapter Review:** This section contains a series of questions that review the chapter outcomes. Answers are in the textbook as well as the *Teacher Resource Book 12*.

**Case Study:** This section requires students to express their understanding of the skills they have learned. Answers are in the textbook as well as the *Teacher Resource Book 12*.

## IV. Technology

The use of technology in our society is increasing and technological skills are becoming mandatory in the workplace. It is assumed that all students have a scientific calculator and its manual for their individual use. Ensure that the calculator used has “scientific” on it as there are calculators designed for business and statistics which would not have the functions needed for this course. Although students will sometimes use a calculator, they should first complete most problems using pencil and paper.

## To the Instructor

### V. Curriculum Guides

Each new ABE Mathematics course has a Curriculum Guide for the instructor and a Study Guide for the student. The Curriculum Guide includes the specific curriculum outcomes for the course. Suggestions for teaching, learning, and assessment are provided to support student achievement of the outcomes. Each course is divided into units. Each unit comprises a **two-page layout of four columns** as illustrated in the figure below. In some cases the four-column spread continues to the next two-page layout.

#### Curriculum Guide Organization: The Two-Page, Four-Column Spread

Unit Title	Unit Title		
Outcomes	Notes for Teaching and Learning	Suggestions for Assessment	Resources
Specific curriculum outcomes for the unit.	Suggested activities, elaboration of outcomes, and background information.	Suggestions for assessing students' achievement of outcomes.	Authorized and recommended resources that address outcomes.

### VI. Study Guides

The Study Guide provides the student with the name of the text(s) required for the course and specifies the sections and pages that the student will need to refer to in order to complete the required work for the course. It guides the student through the course by assigning relevant reading and providing questions and/or assigning questions from the text or some other resource. Sometimes it also provides important points for students to note. (See the *To the Student* section of the Study Guide for a more detailed explanation of the use of the Study Guides.) The Study Guides are designed to give students some degree of independence in their work. Instructors should note, however, that there is much material in the Curriculum Guides in the *Notes for Teaching and Learning* and *Suggestions for Assessment* columns that is not included in the Study Guide and instructors will need to review this information and decide how to include it.

## To the Instructor

## VII. Resources

### *Essential Resources*

*Essentials of Mathematics 12*, ISBN: 0-7726-4997-9

*Essentials of Mathematics 12, Teacher Resource Book 12*, ISBN:0-7726-5049-7

Mathematics 3107C Study Guide

### *Resources*

Math Links: <http://mathforum.org>  
<http://www.purplemath.com/index.htm>  
<http://edHelper.com>  
<http://www.educationindex.com/math/>  
<http://learner.org/exhibits/dailymath/resources.html>

## VIII. Recommended Evaluation

Written Notes	10%
Assignments	10%
Test(s)	30%
Final Exam ( <i>entire course</i> )	<u>50%</u> 100%

# **Variation and Formulas**

## Variation and Formulas

### Outcomes

1.1 Investigate examples of a direct variation.

1.1.1 Given a graph of a direct variation, identify the independent and dependent variables, determine the slope and state the formula for the variation.

1.1.2 Given a direct variation, make a table of values and graph the variation.

1.1.3 Recognize that the equation of a direct variation has the form  $y = kx$ .

1.1.4 Develop a formula for a given direct variation.

1.1.5 Recognize the general shape of a direct variation.

1.2 Substitute appropriate values into formulas and evaluate for the desired variable.

1.2.1 Rearrange formulas to isolate the desired variable.

### Notes for Teaching and Learning

The main goal of this unit is to explore four different types of variations. Students will learn to use descriptions, tables of values and graphs to determine which type of variation is being discussed. Students will also learn to interpret graphs and use formulas to solve real-world problems.

Since the Chapter Project is best suited as a group activity, it is not required for this course.

In the Study Guide, students are reminded to read **Hints** and do **Mental Math** problems which are on the bottom of the textbook pages. The instructor should encourage students to complete these activities. The instructor should ensure that students work through and understand the given solution for each **Example**.

The **Small Group Activity** on page 284 has been assigned to students. Students should complete this activity individually. They should construct both tables and answer all the questions that are required. A review of slope and how to calculate it may be necessary here.

Before completing **Example 1** on page 285 the instructor should review dependent and independent variables and how to identify them from a description of a variation or a graph.

The instructor should emphasize to students that a direct variation has a straight line graph that passes through  $(0, 0)$  and always has the form  $y = kx$ , where  $y$  is the dependent variable,  $x$  is the independent variable, and  $k$  is the constant of variation. The constant,  $k$ , is the same as the slope of the straight line graph. The instructor should show how to find  $k$  using a graph or through substitution of values given in a description of the variation.

A review of interpolation, extrapolation, substitution and graphing may also be required in this section.

## Variation and Formulas

### Suggestions for Assessment

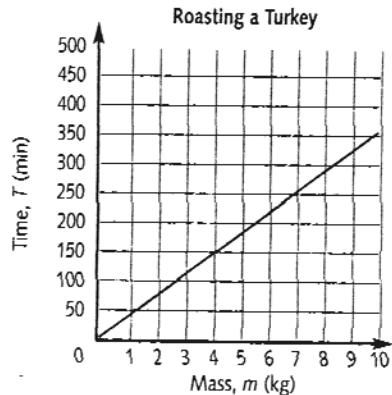
Study Guide questions 1.1 to 1.4 should meet the objectives of Outcomes 1.1 and 1.2.

The **Chapter Review** on pages 346 and 347, questions 2 and 3, can also be used for further assessment of Outcomes 1.1 and 1.2.

The Appendix contains a sheet of graph paper that can be photocopied and distributed to students for use when creating graphs of variations.

The following question can also be used for further assessment.

1. Consider the following graph, which gives the time needed to roast a turkey.



- Explain why this is a direct variation.
- Identify the dependent and independent variables.
- Determine the slope from the graph.
- Give a formula for the variation.
- How much time would it take to roast a turkey with a mass of 15 kg?

### Resources

*Essentials of Mathematics 12*,  
Direct Variation, pages 281,  
284 - 295

**Chapter Review**, pages 346  
and 347

*Teacher Resource Book 12*,  
pages 181 - 188

Appendix, graph paper

## Variation and Formulas

### Outcomes

1.3 Investigate examples of a partial variation.

1.3.1 Given a graph of a partial variation, identify the independent and dependent variables, determine the slope and the fixed value and state the formula for the variation.

1.3.2 From a description given in words, develop a formula, construct a table of values, and draw a graph of a partial variation.

1.3.3 Recognize that the equation of a partial variation has the form  $y = kx + F$ .

1.3.4 Recognize the general shape of a partial variation.

1.4 Substitute appropriate values into formulas and evaluate for the desired variable.

### Notes for Teaching and Learning

Students are **not** required to complete the **Small Group Activity** on page 297. However, the instructor may assign this activity at his or her discretion if more than one student is completing this part of the course simultaneously. The instructor may also help the student complete the activity.

The instructor should emphasize to students that a partial variation is very similar to a direct variation. A partial variation has a straight line graph where the slope is equal to the constant of variation,  $k$ , but the graph does **not** pass through the point  $(0, 0)$ . In a partial variation, the graph passes through a fixed value  $F$  on the vertical axis, or  $y$ -axis. A partial variation always has the form  $y = kx + F$ , where  $y$  is the dependent variable,  $x$  is the independent variable,  $k$  is the constant of variation, and  $F$  is the fixed value. The instructor should show how to find  $k$  using a graph or through substitution of the given values from a description of the variation. The instructor should also review how to find the fixed value,  $F$ , of a variation when given a graph or a description in words.

Although students will not be required to define them, they should understand the terms **fixed cost** (a cost that remains constant) and **variable cost** (a cost that changes depending upon the amount of goods purchased).

**Note:** The instructor should remind students that **Example 3** on page 301 is to be omitted from this section.

## Variation and Formulas

### Suggestions for Assessment

Study Guide questions 1.5 and 1.6 should meet the objectives of Outcomes 1.3 and 1.4.

The **Chapter Review** on page 347, question 4, can also be used for further assessment of Outcomes 1.3 and 1.4.

The following question can be used as further assessment.

1. A private parking lot charges \$1.00 to park on their lot for any amount of time up to 30 minutes. Additional time is rounded up to the nearest half hour and cost \$0.75 per half hour to a maximum of \$5.50 per day.
  - a) Identify the type of variation.
  - b) Complete a table of values in 30 minute intervals that shows the cost of parking.
  - c) Graph the variation.
  - d) Find the slope and the fixed value from the graph.
  - e) Find the formula for the variation.

### Resources

*Essentials of Mathematics 12*,  
Partial Variation, pages 296 - 303

**Chapter Review**, page 347

*Teacher Resource Book 12*,  
pages 189 - 192

## Variation and Formulas

### Outcomes

1.5 Investigate examples of a direct squared variation.

1.5.1 From a description given in words, develop a formula, construct a table of values, and draw a graph of a direct squared variation.

1.5.2 Recognize that the equation of a direct squared variation has the form  $y = kx^2$ .

1.5.3 Recognize the general shape of a direct squared variation.

1.6 Substitute appropriate values into formulas and evaluate for the desired variable.

### Notes for Teaching and Learning

The **Small Group Activity** on page 306 has been assigned to students in the Study Guide. Students should complete this activity individually.

For the **Small Group Activity** the instructor should remind students that the formula for the area of a square is  $A = l^2$ , where  $l$  is the length of the side of the square. In part c), to write the formula for the graph, the instructor should have students examine how the independent and dependent variables are related by looking at the table of values and the graph.

The instructor should emphasize to students that in a direct squared variation, the independent variable is squared. This type of variation has a curved graph with the curve beginning at the point  $(0, 0)$ . A direct squared variation always has the form  $y = kx^2$ , where  $y$  is the dependent variable,  $x$  is the independent variable, and  $k$  is the constant of variation. The instructor should show students how to find  $k$  by substituting in the given values from a description of the variation.

**Note:** The instructor should remind students to include units in their answers whenever necessary throughout this entire unit.

Students are **not** required to complete **Problem Analysis and Games** on pages 312 and 313.

## Variation and Formulas

### Suggestions for Assessment

Study Guide questions 1.7 to 1.10 should meet the objectives of Outcomes 1.5 and 1.6.

The **Chapter Review** on page 348, questions 6 and 7, can also be used for further assessment of Outcomes 1.5 and 1.6.

### Resources

*Essentials of Mathematics 12*,  
Direct Squared Variation,  
pages 305 - 311

**Chapter Review**, page 348

*Teacher Resource Book 12*,  
pages 194 - 197

## Variation and Formulas

### Outcomes

1.7 Investigate examples of an inverse variation.

1.7.1 From a description given in words, develop a formula, construct a table of values, and draw a graph of an inverse variation.

1.7.2 Recognize that the equation of an inverse variation has the form  $y = \frac{k}{x}$ .

1.7.3 Recognize the general shape of a direct squared variation.

1.8 Substitute appropriate values into formulas and evaluate for the desired variable.

### Notes for Teaching and Learning

The **Small Group Activity** on page 315 has been assigned to students in the Study Guide. Students should complete this activity individually. A review of division by a fraction may be necessary here. The Appendix contains a review worksheet on division involving fractions.

The instructor should emphasize to students that the graph of an inverse variation decreases as you move to the right along the horizontal axis. This type of variation has a curved graph that does **not** pass through the point  $(0, 0)$ . An inverse variation always has the form  $y = \frac{k}{x}$ , where  $y$  is the dependent variable,  $x$  is the independent variable, and  $k$  is the constant of variation. The instructor should show students how to find  $k$  by substituting in the given values from a description of the variation. Students will find solving for  $k$  difficult here because of the fraction in this variation. It should be stressed that, to solve for  $k$ , students must get rid of the fraction by multiplying both sides of the equation by the number in the denominator of the fraction.

Before completing **Example 2** on page 318, the instructor should explain to students that the term “inversely proportional” means that as the independent variable *increases*, the dependent variable *decreases*. This is evident from the graph of an inverse variation.

Part d) of **Example 2** on page 319 mentions *The Rule of 72*. Students are not responsible for knowing this rule. However, if students would like to know more about this rule they can see *Essentials of Mathematics 11*, page 37.

## Variation and Formulas

### Suggestions for Assessment

Study Guide questions 1.11 to 1.14 should meet the objectives of Outcomes 1.7 and 1.8.

The **Chapter Review** on page 348, question 8, can also be used for further assessment of Outcomes 1.7 and 1.8.

If more work on division involving fractions is necessary, then the worksheet, *Dividing by a Fraction*, is given in the Appendix.

The following questions can be used for further assessment.

1. According to Ohm's Law, the current ( $I$ ) flowing in a wire is inversely proportional to the resistance ( $R$ ) of the wire. If the current is 5 amperes when the resistance is 24 ohms, what is the current when the resistance is 3 ohms?
2. State what kind of variation is represented. Sketch the graph.

x	y
1	360
2	180
3	120
4	90
5	72

### Resources

*Essentials of Mathematics 12*,  
Inverse Variation, pages 314 - 324

**Chapter Review**, page 348

*Teacher Resource Book 12*,  
pages 200 - 204

Appendix, Practice Exercise 2, *Dividing by a Fraction*

## Variation and Formulas

### Outcomes

1.9 Recognize a variation given a description in words, a table of values, or a graph.

1.9.1 Given a graph of a relation, describe it in words and answer questions pertaining to the graph.

1.9.2 Given a description of a variation, identify its graph.

### Notes for Teaching and Learning

Students are **not** required to complete the **Small Group Activity** on page 325. This activity requires at least 6 metres of floor space as well as a great deal of movement throughout the classroom and group discussion. This could be distracting to other students in the classroom who are completing other sections of the course.

## Variation and Formulas

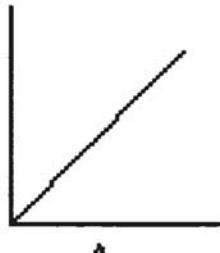
### Suggestions for Assessment

Study Guide questions 1.15 and 1.16 should meet the objectives of Outcome 1.9.

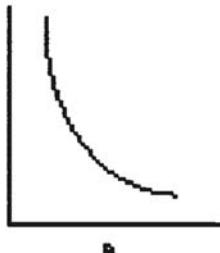
The **Chapter Review** on page 345, question 1 can also be used for further assessment of Outcome 1.9.

The following question can be used for further assessment.

1. Write a relationship that describes each of the following graphs. Be sure to identify the independent and dependent variables.



A



B



C



D

### Resources

*Essentials of Mathematics 12, Recognizing Variations and Other Relations*, pages 325 - 333

**Chapter Review**, page 345

*Teacher Resource Book 12*, pages 206 - 210

## Variation and Formulas

### Outcomes

1.10 Substitute appropriate values into formulas and evaluate for the desired variable.

1.10.1 Rearrange formulas to isolate the desired variable.

### Notes for Teaching and Learning

The **Small Group Activity** on page 335 has been assigned to students in the Study Guide. Students should complete this activity individually.

Students should know that there is a  $\pi$  button on their calculators. They should know how to use this button in calculations. Students should also be made aware that if they use the  $\pi$  button when solving formulas they will obtain a slightly different answer than if they use  $\pi = 3.14$ .

A review of using the order of operations and changing a percent to its decimal equivalent may be necessary here. There are worksheets contained in the Appendix that provide extra practice on these topics.

The **Hints** on pages 336 and 337 provide numerous formulas that students can reference when answering problems in this section. The instructor should emphasize, however, that students are not required to memorize these formulas and that the formulas will be provided on tests and assignments.

Students should be reminded that when solving formulas they should isolate the desired variable first before substituting in the given values. Also, units must be included in final answers. These topics were discussed in Mathematics 3107B.

A worksheet on solving basic equations is provided in the Appendix and has been assigned for homework. This will allow students to become familiar with rearranging formulas to solve for an unknown.

Some of the formulas students may encounter have exponents larger than 2. A review of using a calculator to find the  $n$ th root of a number may be necessary.

## Variation and Formulas

### Suggestions for Assessment

Study Guide questions 1.17 to 1.21 should meet the objectives of Outcome 1.10.

The **Chapter Review** on page 349, questions 9 to 12, can also be used for further assessment of Outcome 1.10.

The Appendix contains a worksheet *Solving Simple Equations* that should be assigned for homework.

The **Case Study** on pages 351 to 353, questions 1 to 4, has been assigned for homework. The instructor, however, may use this as a take-home assignment or some other form of assessment for this unit. Students may find this **Case Study** difficult so it may be beneficial for them to work in pairs.

If more work on the order of operations is necessary, then the worksheet, *Order of Operations*, is given in the Appendix. This worksheet can also be found in the Appendix of the Mathematics 3107B Curriculum Guide.

If more work on changing percents to their decimal equivalents is necessary, then the worksheet, *Percents*, is given in the Appendix. This worksheet can also be found in the Appendix of the Mathematics 3107B Curriculum Guide.

### Resources

*Essentials of Mathematics 12*, Using Formulas, pages 334 - 344

**Chapter Review**, page 349

*Teacher Resource Book 12*, pages 211 - 216, 224 and 225

Appendix, Practice Exercise 1, *Solving Simple Equations*

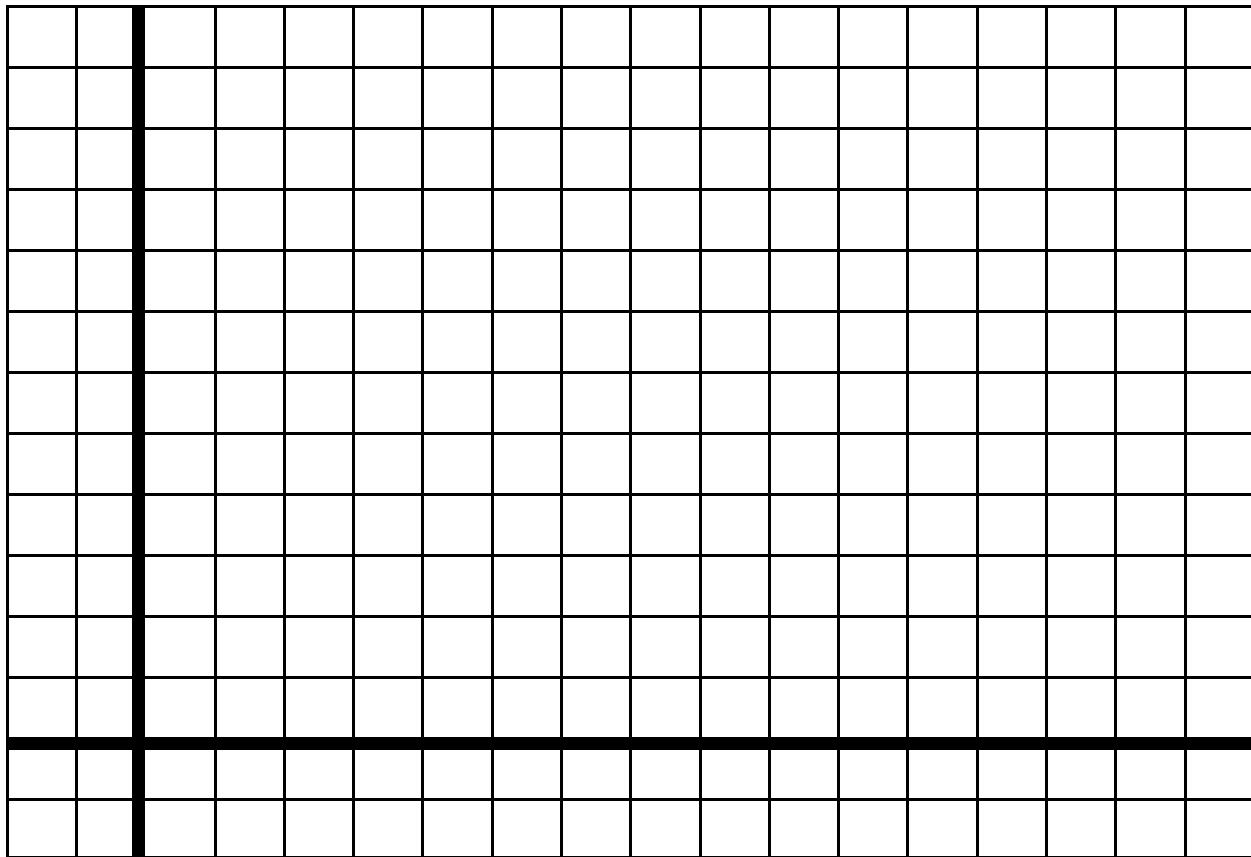
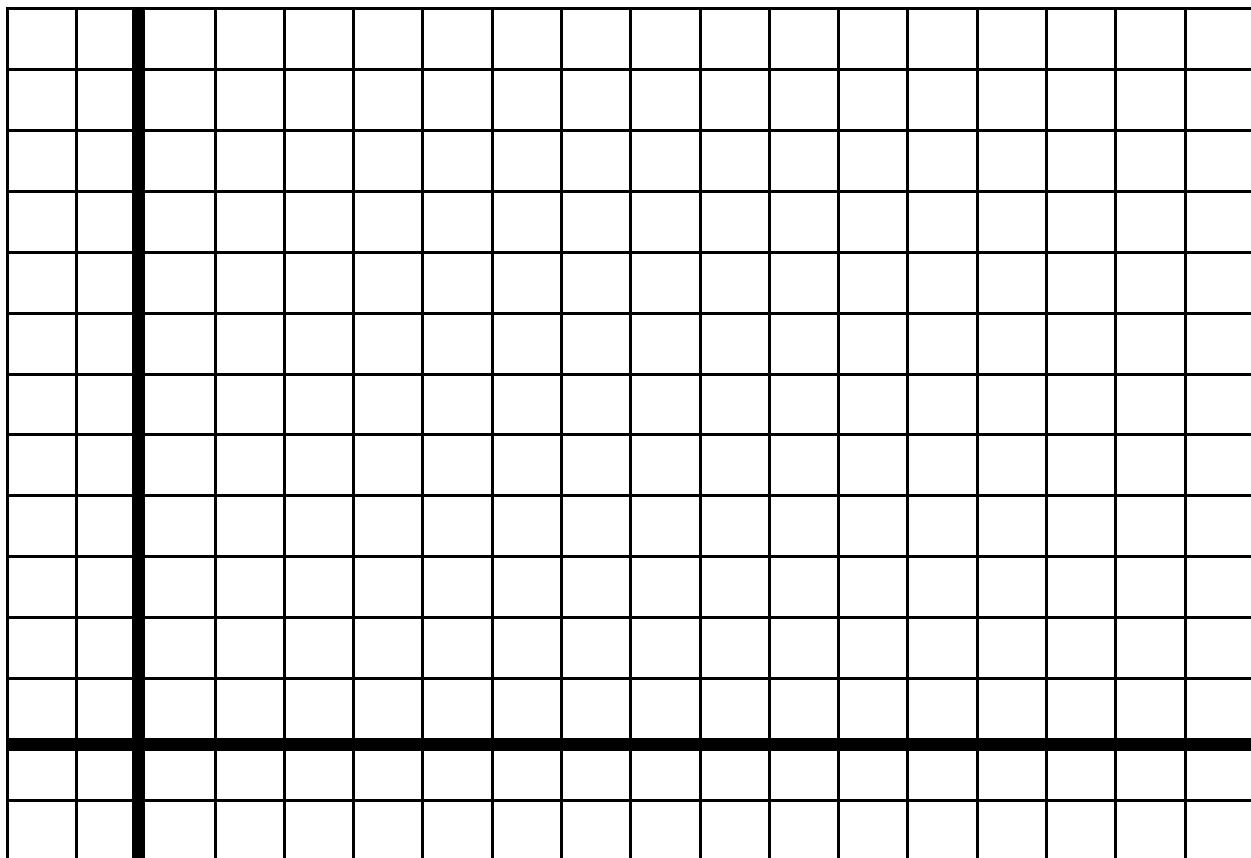
Appendix, Practice Exercise 3, *Order of Operations*

Appendix, Practice Exercise 4, *Percents*



# **Appendix**







**Practice Exercise 1**  
**Solving Simple Equations**

**Name:** \_\_\_\_\_

Solve each equation for the unknown.

1. $r - 2 = 55$	2. $70 - g = 27$	3. $124 = b + 76$
4. $8 = \frac{c}{4}$	5. $5 + w = 121$	6. $63 = 9h$
7. $52 = q - 35$	8. $74 - s = 22$	9. $6a = 12$
10. $y + 41 = 66$	11. $70 = 66 + u$	12. $4 = \frac{j}{5}$
13. $8z = 72$	14. $114 = 49 + f$	15. $42 - v = 26$
16. $9 = 3n$	17. $89 = 74 + m$	18. $2 = e - 93$
19. $p + 24 = 106$	20. $\frac{k}{12} = 6$	21. $t - 10 = 53$
22. $5 = \frac{x}{35}$	23. $97 = d + 7$	24. $65 - e = 15$
25. $94 = 42 + s$	26. $d - 9 = 37$	27. $\frac{q}{4} = 2$
28. $9 = 3p$	29. $84 = j + 53$	30. $u - 8 = 30$
31. $38 = 96 - z$	32. $v + 72 = 155$	33. $91 = 58 + c$
34. $35 - k = 17$	35. $\frac{x}{8} = 7$	36. $8 = \frac{t}{56}$
37. $11 = 40 - f$	38. $9h = 81$	39. $4n = 24$
40. $99 = 30 + g$	41. $43 = 81 - m$	42. $a + 90 = 107$

## Answer Key Practice Exercise 1

### Solving Simple Equations

1. $r - 2 = 55$ <b><math>r = 57</math></b>	2. $70 - g = 27$ <b><math>g = 43</math></b>	3. $124 = b + 76$ <b><math>b = 48</math></b>
4. $8 = \frac{c}{4}$ <b><math>c = 32</math></b>	5. $5 + w = 121$ <b><math>w = 116</math></b>	6. $63 = 9h$ <b><math>h = 7</math></b>
7. $52 = q - 35$ <b><math>q = 87</math></b>	8. $74 - s = 22$ <b><math>s = 52</math></b>	9. $6a = 12$ <b><math>a = 2</math></b>
10. $y + 41 = 66$ <b><math>y = 25</math></b>	11. $70 = 66 + u$ <b><math>u = 4</math></b>	12. $4 = \frac{j}{5}$ <b><math>j = 20</math></b>
13. $8z = 72$ <b><math>z = 9</math></b>	14. $114 = 49 + f$ <b><math>f = 65</math></b>	15. $42 - v = 26$ <b><math>v = 16</math></b>
16. $9 = 3n$ <b><math>n = 3</math></b>	17. $89 = 74 + m$ <b><math>m = 15</math></b>	18. $2 = e - 93$ <b><math>e = 95</math></b>
19. $p + 24 = 106$ <b><math>p = 82</math></b>	20. $\frac{k}{12} = 6$ <b><math>k = 72</math></b>	21. $t - 10 = 53$ <b><math>t = 63</math></b>
22. $5 = \frac{x}{35}$ <b><math>x = 175</math></b>	23. $97 = d + 7$ <b><math>d = 90</math></b>	24. $65 - e = 15$ <b><math>e = 50</math></b>
25. $94 = 42 + s$ <b><math>s = 52</math></b>	26. $d - 9 = 37$ <b><math>d = 46</math></b>	27. $\frac{q}{4} = 2$ <b><math>q = 8</math></b>
28. $9 = 3p$ <b><math>p = 3</math></b>	29. $84 = j + 53$ <b><math>j = 31</math></b>	30. $u - 8 = 30$ <b><math>u = 38</math></b>
31. $38 = 96 - z$ <b><math>z = 58</math></b>	32. $v + 72 = 155$ <b><math>v = 83</math></b>	33. $91 = 58 + c$ <b><math>c = 33</math></b>
34. $35 - k = 17$ <b><math>k = 18</math></b>	35. $\frac{x}{8} = 7$ <b><math>x = 56</math></b>	36. $8 = \frac{t}{56}$ <b><math>t = 448</math></b>
37. $11 = 40 - f$ <b><math>f = 29</math></b>	38. $9h = 81$ <b><math>h = 9</math></b>	39. $4n = 24$ <b><math>n = 6</math></b>
40. $99 = 30 + g$ <b><math>g = 69</math></b>	41. $43 = 81 - m$ <b><math>m = 38</math></b>	42. $a + 90 = 107$ <b><math>a = 17</math></b>

**Practice Exercise 2**  
**Dividing by a Fraction**

**Name:** \_\_\_\_\_

1. $6 \div \frac{1}{3}$	2. $7 \div \frac{1}{8}$
3. $8 \div \frac{4}{5}$	4. $10 \div \frac{5}{16}$
5. $4 \div \frac{2}{5}$	6. $18 \div \frac{9}{10}$
7. $6 \div \frac{4}{5}$	8. $10 \div \frac{2}{3}$
9. $12 \div \frac{15}{16}$	10. $15 \div \frac{21}{32}$
11. $5 \div \frac{3}{4}$	12. $13 \div \frac{2}{3}$
13. $9 \div \frac{7}{8}$	14. $14 \div \frac{5}{6}$
15. $7 \div \frac{9}{10}$	16. $8 \div \frac{1}{2}$

**Answer Key for Practice Exercise 2**  
**Dividing by a Fraction**

1. $6 \div \frac{1}{3}$  18	2. $7 \div \frac{1}{8}$  56
3. $8 \div \frac{4}{5}$  10	4. $10 \div \frac{5}{16}$  32
5. $4 \div \frac{2}{5}$  10	6. $18 \div \frac{9}{10}$  20
7. $6 \div \frac{4}{5}$  $\frac{15}{2}$	8. $10 \div \frac{2}{3}$  15
9. $12 \div \frac{15}{16}$  $\frac{64}{5}$	10. $15 \div \frac{21}{32}$  $\frac{160}{7}$
11. $5 \div \frac{3}{4}$  $\frac{20}{3}$	12. $13 \div \frac{2}{3}$  $\frac{39}{2}$
13. $9 \div \frac{7}{8}$  $\frac{72}{7}$	14. $14 \div \frac{5}{6}$  $\frac{84}{5}$
15. $7 \div \frac{9}{10}$  $\frac{70}{9}$	16. $8 \div \frac{1}{2}$  16

**Practice Exercise 3**  
**Order of Operations**

**Name:** \_\_\_\_\_

1. $(45 \div 9) + (12 \times 49 - 1)$	2. $93 \times 1 + 5 \times 2$
3. $67 + (52 - 47 - 4 \times 1)$	4. $32 \div 8 + 55$
5. $9 \times 4 + 19$	6. $(87 - 32) + 2$
7. $5 + 4 + 37 - 3$	8. $(30 \div 2) \times 48 - (50 + 1)$
9. $(5 \times 23) + (22 \times 4)$	10. $67 - 80 \div 8 - 2$
11. $(68 \times 41) \times (3 + 20)$	12. $56 - 3 \times 4$
13. $8 \times 12 + 39 + 38$	14. $5 - (39 - 52) + 24 \div 3$
15. $56 \div 4 \times 28 + 3 \times 14$	16. $(7 - 41) + (55 - 19)$
17. $30 \div 5 + 2$	18. $9 \times (16 \div 4 - 4)$
19. $6 + 12 \div 2$	20. $93 \div 3 + (3 \times 50)$
21. $9 \times 2 - 14$	22. $54 \times 3 \times 1$
23. $5 + (60 \div 2)$	24. $8 \times 56 \div 8 + 2$
25. $5 - 19 + (2 \times 5 + 25)$	26. $95 - 45 - 1 + 4$
27. $79 + 2 - 5$	28. $(61 \times 2) + 21$
29. $(9 \times 23) \times (24 \div 4) \times 2$	30. $76 + 1 - 25 - 3$

## Answer Key for Practice Exercise 3

### Order of Operations

1. $(45 \div 9) + (12 \times 49 - 1)$	<b>592</b>	2. $93 \times 1 + 5 \times 2$	<b>103</b>
3. $67 + (52 - 47 - 4 \times 1)$	<b>68</b>	4. $32 \div 8 + 55$	<b>59</b>
5. $9 \times 4 + 19$	<b>55</b>	6. $(87 - 32) + 2$	<b>57</b>
7. $5 + 4 + 37 - 3$	<b>43</b>	8. $(30 \div 2) \times 48 - (50 + 1)$	<b>669</b>
9. $(5 \times 23) + (22 \times 4)$	<b>203</b>	10. $67 - 80 \div 8 - 2$	<b>55</b>
11. $(68 \times 41) \times (3 + 20)$	<b>64 124</b>	12. $56 - 3 \times 4$	<b>44</b>
13. $8 \times 12 + 39 + 38$	<b>173</b>	14. $5 - (39 - 52) + 24 \div 3$	<b>26</b>
15. $56 \div 4 \times 28 + 3 \times 14$	<b>434</b>	16. $(7 - 41) + (55 - 19)$	<b>2</b>
17. $30 \div 5 + 2$	<b>8</b>	18. $9 \times (16 \div 4 - 4)$	<b>0</b>
19. $6 + 12 \div 2$	<b>12</b>	20. $93 \div 3 + (3 \times 50)$	<b>181</b>
21. $9 \times 2 - 14$	<b>4</b>	22. $54 \times 3 \times 1$	<b>162</b>
23. $5 + (60 \div 2)$	<b>35</b>	24. $8 \times 56 \div 8 + 2$	<b>58</b>
25. $5 - 19 + (2 \times 5 + 25)$	<b>21</b>	26. $95 - 45 - 1 + 4$	<b>53</b>
27. $79 + 2 - 5$	<b>76</b>	28. $(61 \times 2) + 21$	<b>143</b>
29. $(9 \times 23) \times (24 \div 4) \times 2$	<b>2484</b>	30. $76 + 1 - 25 - 3$	<b>49</b>

## Practice Exercise 4

### Percents

Name: \_\_\_\_\_

Write each percent as its decimal equivalent.

1. 42%	2. 74%	3. 8%	4. 50%	5. 17%
6. 96%	7. 69%	8. 38%	9. 81%	10. 3%
11. 1%	12. 25%	13. 73%	14. 30%	15. 97%
16. 7%	17. 89%	18. 53%	19. 41%	20. 4%
21. 66%	22. 14%	23. 18%	24. 52%	25. 87%
26. 64%	27. 6%	28. 48%	29. 29%	30. 2%
31. 100%	32. 93%	33. 76%	34. 85%	35. 5%
36. 72%	37. 61%	38. 0%	39. 27%	40. 9%
41. 58%	42. 19%	43. 35%	44. 70%	45. 13%

## Answer Key for Practice Exercise 4

### Percents

1. 42%	2. 74%	3. 8%	4. 50%	5. 17%
<b>0.42</b>	<b>0.74</b>	<b>0.08</b>	<b>0.5</b>	<b>0.17</b>
6. 96%	7. 69%	8. 38%	9. 81%	10. 3%
<b>0.96</b>	<b>0.69</b>	<b>0.38</b>	<b>0.81</b>	<b>0.03</b>
11. 1%	12. 25%	13. 73%	14. 30%	15. 97%
<b>0.01</b>	<b>0.25</b>	<b>0.73</b>	<b>0.3</b>	<b>0.97</b>
16. 7%	17. 89%	18. 53%	19. 41%	20. 4%
<b>0.07</b>	<b>0.89</b>	<b>0.53</b>	<b>0.41</b>	<b>0.04</b>
21. 66%	22. 14%	23. 18%	24. 52%	25. 87%
<b>0.66</b>	<b>0.14</b>	<b>0.18</b>	<b>0.52</b>	<b>0.87</b>
26. 64%	27. 6%	28. 48%	29. 29%	30. 2%
<b>0.64</b>	<b>0.06</b>	<b>0.48</b>	<b>0.29</b>	<b>0.02</b>
31. 100%	32. 93%	33. 76%	34. 85%	35. 5%
<b>1</b>	<b>0.93</b>	<b>0.76</b>	<b>0.85</b>	<b>0.05</b>
36. 72%	37. 61%	38. 0%	39. 27%	40. 9%
<b>0.72</b>	<b>0.61</b>	<b>0</b>	<b>0.27</b>	<b>0.09</b>
41. 58%	42. 19%	43. 35%	44. 70%	45. 13%
<b>0.58</b>	<b>0.19</b>	<b>0.35</b>	<b>0.7</b>	<b>0.13</b>