

*Homeschool Packet*

# *Algebra 1*

*An Incremental Development*

THIRD EDITION

SAXON

*Algebra I: An Incremental Development*  
*Third Edition*

Homeschool Packet

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Prepress Manager: J. Travis Rose

Production Coordinator: Joan Coleman

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*Reaching us via the internet*

**WWW:** [www.saxonpublishers.com](http://www.saxonpublishers.com)

**E-mail:** [info@saxonpublishers.com](mailto:info@saxonpublishers.com)

# *Homeschool Packet*

*for*

# *Algebra 1*

*An Incremental Development, Third Edition*

**John H. Saxon, Jr.**

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## *Answers*

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## Using Saxon Materials in a Homeschool Environment

### Introduction

This guide to using the Saxon Homeschool Math and Physics programs has been designed to help homeschoolers using our *Math 54* through *Calculus* and *Physics* get the most benefit from our program. Please read through this carefully and consider the advice given. Among all of the available learning programs, the Saxon program is unique. Some of this advice is common sense. However, many of these guidelines are specific to the Saxon program and require special attention by the parent-teacher and the student.

### Materials Available

The basic package Saxon Publishers offers for homeschool students for grades four and above consists of a student textbook, test booklet, and answer booklet. The test booklets for *Math 54* through *Math 87* include test forms, facts practice problems, answer grids, and all activity masters needed. The answer booklet includes answers to all the problems in the textbook, answers to the facts practice problems, and solutions to the tests.

Also available from Saxon Publishers are solutions manuals for *Algebra 1/2* through *Calculus* and *Physics*. The solutions manuals contain step-by-step solutions for each problem in every lesson. These manuals are highly recommended as a powerful tool to aid in evaluating the student or to assist the student in developing solution strategies. To order any of our materials, please consult our catalog or call our customer service department at (800) 416-8171.

If you have access to the Internet, you can take advantage of our online services. Our World Wide Web site contains our latest catalogs, teacher resources, in-service information, errata, and much more. You can visit our site at <http://www.saxonhomeschool.com>. You can also contact us by E-mail to get general or specific help. For general help, our E-mail address is [info@saxonhomeschool.com](mailto:info@saxonhomeschool.com). For help with specific math questions, please send E-mail to [mathhelp@saxonhomeschool.com](mailto:mathhelp@saxonhomeschool.com).

### Planning the Course

The first step when planning a course of study is to determine a schedule for how many lessons will be taught each week. To do this, find the total number of lessons in the textbook being studied. All lessons should be taken into account, including the review lessons, the numbered lessons, and any extra sections to be studied. Next, divide the total number of lessons by the amount of time desired to complete the textbook. For example, if you are beginning the *Algebra 1* program, its textbook has 120 lessons. Dividing the total number of lessons by the total number of weeks in a regular school year (estimated at 36 weeks) gives you approximately 3.33 lessons per week. This means you will need to complete 3 to 4 lessons per week in order to cover every lesson in the textbook within a school year. A student will most likely be able to complete lessons in a shorter period of time at the beginning of a book and will take longer for each lesson towards the end. A similar strategy can be used to develop a time schedule to meet your own specific needs. Once you have developed your schedule, try to maintain a constant pace. *This is a very important point.* If a student's study schedule is broken up or erratic, his or her quality of learning will suffer.

It is also important to assure that the student is adequately prepared for each successive textbook. Knowledge of the basic addition, subtraction, multiplication, and division facts is crucial for success in mathematics. The Saxon Middle Grade Series, which includes *Math 54* through *Math 87*, continually practices these facts to ensure full mastery. To assist in this process we use several methods. For instance, fact cards, called *Middle Grades Basic Facts*, are available from our catalog. We also employ facts practice problems which are incorporated into the test booklets. These facts are designed to be practiced as speed drills so that the student becomes progressively faster at answering each fact. Regular practice with these facts will allow for a smoother transition between textbooks.

## Teaching the Lessons

Though the textbook is the main tool for student learning, the help of a knowledgeable and concerned parent-teacher enhances the learning process. **The parent-teacher must assume responsibility for the student's education.** This can best be accomplished by ensuring that the student demonstrates competency in each area of study before continuing to the next, and making sure that the student completes all assignments. **Do not allow the student to do independent study.**

Part of the parent-teacher's responsibility lies in being prepared. Each lesson should be read and fully understood by the parent-teacher before being taught. This will ensure that any questions that may arise can be answered quickly and accurately. If, after reading the lesson, the parent-teacher is uncomfortable with any material, further assistance should be sought through other knowledgeable sources.

Each lesson is designed to be taught within fifteen to twenty minutes. This allows more time for actual problem solving by the student. During the lecture period, all lesson material should be presented and any example problems should be demonstrated. The student should also maintain a notebook that includes any relevant information presented in the lesson. For example, any formulas, definitions, or strategies should be written in the notebook for quick and easy reference in future problem sets. Especially important are bold words or sentences and boxed items. The notebook should be maintained daily in an organized fashion. After the lecture, the student should work the practice problems first to make sure that he/she has grasped the basic concepts discussed in that lesson. With the remaining time allotted (preferably 40–60 minutes, depending on the subject matter), the student should begin the problem set. The parent-teacher should be available for assistance and guidance during this period. When this time period has expired, instruct the student to complete the remaining problems before the next lecture. It is important that the student be responsible for completing **all** the problems in the problem sets. Only in this way will the student succeed in mathematics.

## Assigning the Problem Sets

Before working the problem sets, there are several things of which the parent-teacher and student should be aware. First of all, it is impossible to construct an example problem for each type of problem in the problem sets. Many problems are designed to extend the concepts already learned by the student. If the student cannot work a problem, he or she should first return to the lesson or lessons relevant to that problem in order to gain further insight. After reviewing the lesson, if the student is still having problems, he or she should then seek parent-teacher assistance. It is important that the student develop an individual problem-solving strategy. The student should copy the problem, write legibly, and show all of his or her work. The student should attempt to solve the problem using clear, logical steps. The steps that a student uses to solve the problem should be evident in his or her solution. A final point to consider is when to use a calculator. A calculator should only be used in problems involving complicated decimal computations, radicals, trigonometric functions, or logarithmic functions.

When the student has completed an assigned problem set, it must be evaluated by the parent-teacher. If time allows, check each problem to ensure that all work was shown and that the correct answer was obtained; otherwise, spot-check an assortment of problems. When comparing the student's answers to the answer booklet or solutions manual, be aware of equivalent forms of the same answer (e.g.,  $\frac{3}{2} = 1\frac{1}{2} = 1.5$ ). These equivalent forms are usually counted correct unless the problem asks for a specific form. Also, recognize that problems involving rounding or estimation may not exactly match the given answer, but should be relatively close. Each problem with an incorrect answer must be examined to determine where the error occurred. Review all errors with the student to determine whether the error was a computational error or a conceptual error. Any concepts not understood by the student should be re-taught as soon as possible so that the student will be able to work related problems in the future. If the parent-teacher and student, after referring back to the

relevant lesson or lessons, still have questions regarding a specific problem in the textbook, they may seek further help from the *Saxon Publishers Math Helpline*.

### **Saxon Publishers Math Helpline**

(405) 573-6451

The helpline is designed solely to answer questions concerning lessons and problem sets in Saxon textbooks. Help is available each weekday from 2:00 p.m. to 5:00 p.m. (CST).

Before calling our helpline, please make every attempt to solve your problem. Keep in mind that many mathematical concepts may not be obvious upon first reading, but do become familiar with rereading and practice.

## **Assessing the Student**

After a concept has been practiced, the student has an opportunity to demonstrate his/her competency of the learned material. Two methods of assessing the student are facts practices and tests. Facts practice is a component of the Saxon Middle Grades Series and for *Math 54* and *Math 65* in particular. Facts practice sheets are designed to be given at the beginning of each lecture period and then reviewed with the student. The student should keep track of his or her time and get progressively faster as the course continues.

The second method of assessment is tests. Tests are provided that contain problems similar to those that have been practiced for at least several lessons. In *Math 54* through *Math 87*, tests are given every five lessons, beginning with Lesson 10. In *Algebra 1/2* through *Calculus*, tests are given every four lessons. Testing schedules are provided in the Homeschool Packets.

On these tests, the student will use the same problem-solving methods and strategies used for the homework. The test problems should be copied and worked on a separate sheet of paper. *This sheet of paper should not be scratch paper.* Allowing the use of scratch paper may falsely convey that it is acceptable for the student to be messy and disorganized. The sheet(s) of paper should be  $8\frac{1}{2}'' \times 11''$  ruled notebook paper or any type of standard graph paper, such as 1-cm grid paper. The student should write legibly and in an organized manner, precisely showing each step taken to determine the answer. It is important for the student to show all work so that understanding and strategy can be analyzed.

Each test problem should be graded by comparing the student's answer with the answer provided. If an answer does not match, determine where the mistake was made. After grading, review the test with the student and allow him or her to decide whether the mistakes were computational or conceptual. Be sure to let the student determine the location and type of mistake. The parent-teacher should only verify or reinforce the student's conclusion. Addition and subtraction errors, incorrectly copied problems, and careless mistakes are considered to be computational mistakes. Emphasize to the student that computational mistakes can be avoided by careful review of his or her solutions before completing the assignment. Conceptual mistakes, however, are usually caused by a lack of understanding of the material and should be promptly dealt with by reviewing and practicing the problematic concepts in the relevant lesson(s). Also, in order to see if the same type of problem is being missed repeatedly, the parent-teacher should both save and refer to old tests. If such a situation is discovered, the cause should be determined before continuing.

## Getting Started

Consult these guidelines regularly for assistance and direction. Before beginning, remember that the Saxon program is meant to be flexible. The parent-teacher and student must decide what they are capable of accomplishing. Establish a schedule that works for you and your student. Do not try to go too fast. The main objectives are consistency and completion of the entire textbook, including every problem. Even if a student is familiar with a topic, do not skip that particular lesson. Review can only help with future learning. Remember, mathematics is not difficult. Mathematics is just different. Practice and dedication will turn things unfamiliar and different into things familiar.

## Acknowledgments

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## Reference Summary

### Planning the Course

- Determine the number of weeks you have to complete the book.
- Determine the total number of lessons in the book.
- Divide the number of lessons by the number of weeks.
- Be sure to complete about the same number of lessons each week.

### Teaching the Lessons

- Be sure that the student completes all assignments.
- Do not allow the student to do independent study.
- Read and understand each lesson before teaching it.
- Teach for only 15–20 minutes.
- Have the student keep a notebook.
- Make sure that the student completes all practice problems.
- Make sure that all problems in the problem set are completed.

### Assigning the Problem Sets

- Have the student refer to previous material, if necessary.
- Assist the student in developing a logical problem-solving strategy.
- Allow calculators only with complicated problems.
- Watch out for equivalent answers (e.g.,  $\frac{3}{2} = 1\frac{1}{2} = 1.5$ ).
- Watch out for estimated answers; close ones are counted correct.
- Review all errors with the student.

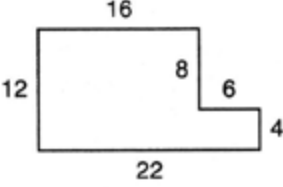
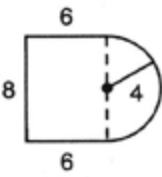
### Assessing the Student

- Use facts practice with Saxon Middle Grades Series.
- Do not allow scratch paper on tests.
- Allow the student to determine problem areas.
- Reteach any misunderstood concepts.

### Contacting Us

- *Customer Service:* (800) 416-8171
- *Saxon Math Helpline:* (405) 573-6451
- *WWW:* <http://www.saxonhomeschool.com>
- *E-mail:* [info@saxonhomeschool.com](mailto:info@saxonhomeschool.com)  
[mathhelp@saxonhomeschool.com](mailto:mathhelp@saxonhomeschool.com)

## Test 1

1. (a)  $90^\circ$   
(2)  
(b)  $180^\circ$
2. (a) Obtuse triangle: a triangle that has one angle with a measure greater than  $90^\circ$   
(2)  
(b) Scalene triangle: a triangle that has no sides of equal length
3. Rectangle  
(2)
4. Regular polygons  
(2)
5.  $180^\circ$   
(2)
6.  $C = 2\pi r = 2\pi(5) = 10\pi$  cm  
(3)
7.  $C = \pi D = \pi(12) = 12\pi$  in.  
(3)
8.  $36 \text{ in.} \times \frac{1 \text{ ft}}{12 \text{ in.}} \times \frac{1 \text{ yd}}{3 \text{ ft}} = \frac{36}{(12)(3)} \text{ yd}$   
(4)
9. Natural numbers  
(4)
10.  $s = P + 4 = (24) + 4 = 6$  m  
(3)
11.  $40 + 90 = 130$   
(2)  
 $x = 180 - (130) = 50$
12. (3)  
  
 $P = 12 + 16 + 8 + 6 + 4 + 22 = 68$  m
13. (3)  
  
 $P = 6 + 8 + 6 + \frac{2\pi(4)}{2}$   
 $= 20 + \frac{8\pi}{2}$   
 $= (20 + 4\pi)$  m
14.  $\frac{5}{2} \times \frac{4}{3} \times \frac{9}{10} = 3$   
(4)
15.  $3\frac{2}{5} + 5\frac{3}{10} = 3\frac{4}{10} + 5\frac{3}{10} = 8\frac{7}{10}$   
(1)

$$16. \quad 3\frac{1}{2} + 5\frac{3}{5} = \frac{7}{2} + \frac{28}{5} = \frac{7}{2} \cdot \frac{5}{28} = \frac{5}{8}$$

(4)

$$17. \quad \frac{12\frac{1}{2}}{3\frac{1}{4}} = \frac{\frac{25}{2}}{\frac{13}{4}} = \frac{25}{2} \cdot \frac{4}{13} = \frac{50}{13} = 3\frac{11}{13}$$

(4)

$$18. \quad \begin{array}{r} 2.3844 \overline{) 11.922} \\ \underline{47688} \phantom{0} \\ 71532 \\ \underline{71532} \\ 0 \end{array}$$

(4)

$$\begin{array}{r} \phantom{23844} \overline{) 119220} \\ \underline{119220} \\ 0 \end{array}$$

$$19. \quad 14\frac{3}{8} - 8\frac{9}{16} = 14\frac{6}{16} - 8\frac{9}{16} = 13\frac{22}{16} - 8\frac{9}{16} = 5\frac{13}{16}$$

(1)

$$20. \quad BC = 3\frac{2}{3} - 1\frac{5}{12} = 3\frac{8}{12} - 1\frac{5}{12} = 2\frac{3}{12}$$

(1)  
 $= 2\frac{1}{4}$  units

## Test 2

1. (a)  $\{1, 2, 3, 4, 5, \dots\}$   
(5)  
(b)  $\{0, 1, 2, 3, 4, 5, \dots\}$   
(c)  $\{\dots, -3, -2, -1, 0, 1, 2, 3, \dots\}$
2. (a) Difference  
(4)  
(b) Product
3. Zero  
(6)
4.  $35 \text{ cm} \times \frac{1 \text{ in.}}{2.54 \text{ cm}} \times \frac{1 \text{ ft}}{12 \text{ in.}} = \frac{35}{(2.54)(12)} \text{ ft}$   
(4)
5.  $250 \text{ yd} \times \frac{3 \text{ ft}}{1 \text{ yd}} \times \frac{12 \text{ in.}}{1 \text{ ft}} = 250(3)(12) \text{ in.}$   
(4)
6.  $P = 2l + 2w = 2(10) + 2(5) = 20 + 10 = 30$  m  
(3)
7. (a)  $C = 2\pi r = 2\pi(7) = 14\pi$  in.  
(3,8)  
(b)  $A = \pi r^2 = \pi(7)^2 = 49\pi$  in.<sup>2</sup>
8.  $-(-4) + (-3) - (-2) = (+4) + (-3) + (+2) = 3$   
(7)
9.  $7 - 6 - (-3) - [ -(-3) ]$   
(7)  
 $= (+7) + (-6) + (+3) + (-3) = 1$



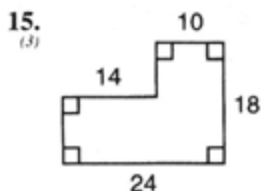
$$10. \quad (7) \quad -|-4| + |-6| - (-5) = (-4) + (+6) + (+5) = 7$$

$$11. \quad (7) \quad 7 - 5 - (-3) + |4 - 12 + 5| \\ = (+7) + (-5) + (+3) + |(+4) + (-12) + (+5)| \\ = 5 + |-3| = 5 + 3 = 8$$

$$12. \quad (11) \quad 9\frac{3}{5} + 5\frac{3}{10} - 7\frac{1}{2} = 9\frac{6}{10} + 5\frac{3}{10} - 7\frac{5}{10} \\ = 14\frac{9}{10} - 7\frac{5}{10} = 7\frac{4}{10} = 7\frac{2}{5}$$

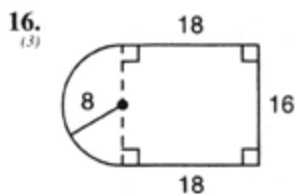
$$13. \quad (14) \quad 6\frac{1}{2} \times 3\frac{1}{3} \times 1\frac{1}{13} = \frac{13}{2} \times \frac{10}{3} \times \frac{14}{13} = \frac{70}{3} = 23\frac{1}{3}$$

$$14. \quad (14) \quad \frac{5\frac{5}{8}}{3\frac{3}{4}} = \frac{\frac{45}{8}}{\frac{15}{4}} = \frac{45}{8} \cdot \frac{4}{15} = \frac{3}{2} = 1\frac{1}{2}$$



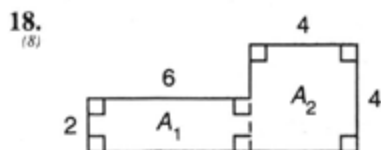
The right-hand vertical segment is 18 in. long, so the unknown vertical lengths must have a sum of 18 in.

$$P = 18 + 18 + 10 + 14 + 24 = 84 \text{ in.}$$



$$P = 18 + 16 + 18 + \frac{2\pi(8)}{2} \\ = 52 + \frac{16\pi}{2} \\ = (52 + 8\pi) \text{ in.}$$

$$17. \quad (8) \quad A = \frac{1}{2}BH = \frac{1}{2}(10)(8) = 40 \text{ ft}^2$$



$$\text{Area} = A_1 + A_2 \\ = (6)(2) + (4)(4) \\ = 12 + 16 \\ = 28 \text{ ft}^2$$

$$19. \quad 30 + 40 = 70 \\ (2) \quad x = 180 - (70) = 110$$

$$20. \quad (1) \quad XY = 5\frac{1}{3} - 3\frac{3}{8} = 5\frac{8}{24} - 3\frac{9}{24} \\ = 4\frac{32}{24} - 3\frac{9}{24} = 1\frac{23}{24} \text{ m}$$

## Test 3

1. (a) 7

(b)  $-\frac{1}{7}$

(c) 1

2. Zero has no reciprocal because division by zero is undefined.

3. (a) Acute angle: an angle whose measure is between  $0^\circ$  and  $90^\circ$

(b) Equilateral triangle: a triangle whose three sides all have equal length

4. (a) Positive number

(b) Negative number

$$5. \quad (4) \quad 70 \text{ m} \times \frac{100 \text{ cm}}{1 \text{ m}} \times \frac{1 \text{ in.}}{2.54 \text{ cm}} = \frac{70(100)}{(2.54)} \text{ in.}$$

$$6. \quad (10) \quad 50 \text{ cm}^2 = 50 \text{ cm} \cdot \text{cm} \times \frac{1 \text{ m}}{100 \text{ cm}} \times \frac{1 \text{ m}}{100 \text{ cm}} \\ = \frac{50}{(100)^2} \text{ m}^2$$

$$7. \quad (8) \quad \text{Length} = \text{area} + \text{width} = (42) + (6) = 7 \text{ m}$$

$$8. \quad (13,8) \quad (a) C = \pi D = \pi(16) = 16\pi \text{ in.}$$

$$(b) r = D + 2 = (16) + 2 = 8 \text{ in.}$$

$$A = \pi r^2 = \pi(8)^2 = 64\pi \text{ in.}^2$$

$$9. \quad (10) \quad (2)(-3)(-4)(-2) = (-6)(-4)(-2) = (24)(-2) = -48$$

$$10. \quad (12) \quad (6)(-3) - (2 - 5)(4 - 1) + |-4 + 3 - 1| \\ = (6)(-3) - (-3)(3) + |-2| \\ = -18 - (-9) + 2 = -7$$

$$11. \quad (6) \quad -|-7 + 2| + 3 - 9 = -|-5| + 3 - 9 \\ = -5 + 3 - 9 = -11$$

$$12. \quad (12) \quad -3(5 + 2) - 2(4 - 2) = -3(7) - 2(2) \\ = -21 - 4 = -25$$

$$13. \quad 2 - \frac{(+24)}{(-6)} - 7 = 2 - (-4) - 7 = -1$$

$$14. \quad \frac{-2 - 8}{-3 + 9 - 6} = \frac{-10}{0}$$

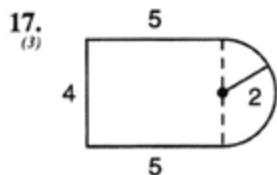
Undefined

$$15. \quad \frac{3(-5 + 3) + (6 - 5)}{-6 - (-2)(-3)} = \frac{3(-2) + (1)}{-6 - (6)}$$

$$= \frac{-6 + 1}{-12} = \frac{-5}{-12} = \frac{5}{12}$$

$$16. \quad \frac{5 - 2 + 3(-2)}{(-2)(-3) - (5)(-2)} = \frac{5 - 2 + (-6)}{6 - (-10)}$$

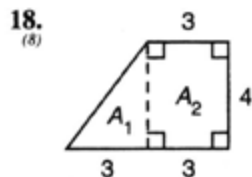
$$= \frac{-3}{16} = -\frac{3}{16}$$



$$P = 5 + 4 + 5 + \frac{2\pi(2)}{2}$$

$$= 14 + \frac{4\pi}{2}$$

$$= (14 + 2\pi) \text{ m}$$



$$\text{Area} = A_1 + A_2$$

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

$$= 6 + 12$$

$$= 18 \text{ in.}^2$$

$$19. \quad \text{Area} = (14)(7) - (9)(3)$$

$$= 98 - 27$$

$$= 71 \text{ ft}^2$$

$$20. \quad 90 + 30 = 120$$

$$x = 180 - (120) = 60$$

## Test 4

1. Since there are an odd number of negative factors, the product is a **negative number**.

2. (a) Sum

- (b) Quotient

$$3. \quad 145 \text{ cm} \times \frac{1 \text{ m}}{100 \text{ cm}} \times \frac{1 \text{ km}}{1000 \text{ m}}$$

$$= \frac{145}{(100)(1000)} \text{ km}$$

$$4. \quad 75 \text{ in.}^2 = 75 \text{ in.} \cdot \text{in.} \times \frac{1 \text{ ft}}{12 \text{ in.}} \times \frac{1 \text{ ft}}{12 \text{ in.}}$$

$$= \frac{75}{(12)^2} \text{ ft}^2$$

$$5. \quad r = D \div 2 = (14) \div 2 = 7 \text{ m}$$

$$A = \pi r^2 = \pi(7)^2 = 49\pi \text{ m}^2$$

$$6. \quad \text{Width} = \text{area} \div \text{length} = (72) \div (8) = 9 \text{ in.}$$

$$7. \quad \text{(a) } -\frac{1}{3}$$

$$\text{(b) } 3$$

$$8. \quad ab - 3a = (-4)(-2) - 3(-4)$$

$$= 8 - (-12)$$

$$= 20$$

$$9. \quad -x(a + b) = -(-2)[(4) + (-5)]$$

$$= -(-2)(-1)$$

$$= -2$$

$$10. \quad -(y - z)(z + y) = -[(-4) - (-2)][(-2) + (-4)]$$

$$= -(-2)(-6)$$

$$= -12$$

$$11. \quad -k[(a - x) - (x + a)]$$

$$= -(-2)[(-1) - (-4)] - [(-4) + (-1)]$$

$$= -(-2)[(3) - (-5)]$$

$$= -(-2)(8)$$

$$= 16$$

$$12. \quad -m[(a - b) - (a - b)]$$

$$= -(-2)[(-3) - (2)] - [(-3) - (2)]$$

$$= -(-2)[(-5) - (-5)]$$

$$= -(-2)(0)$$

$$= 0$$

$$13. \quad -3(-1 - 3)(6 - 8) + 3 = -3(-4)(-2) + 3$$

$$= -24 + 3 = -21$$

$$14. \quad -|(-4)| - \{-[-(-4)]\} = -|4| - (-4)$$

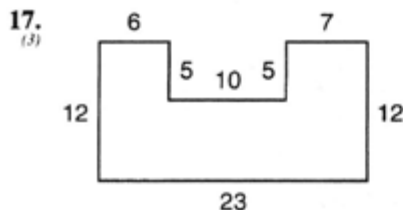
$$= -4 + 4 = 0$$

$$15. \frac{-8 - (-4)(2)}{-3 + 5 + (-2)} = \frac{-8 - (-8)}{0} = \frac{0}{0}$$

Indeterminate

$$16. \frac{(-5 - 4) + (-5 - 4)}{-5 - (-4)} = \frac{(-9) + (-9)}{-1}$$

$$= \frac{-18}{-1} = 18$$



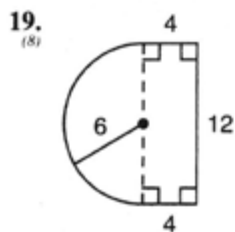
$$P = 12 + 6 + 5 + 10 + 5 + 7 + 12 + 23$$

$$= 80 \text{ yd}$$

$$18. \text{Area} = (16)(12) - \frac{1}{2}(6)(5)$$

$$= 192 - 15$$

$$= 177 \text{ cm}^2$$



$$\text{Area} = (4)(12) + \frac{\pi(6)^2}{2}$$

$$= 48 + \frac{36\pi}{2}$$

$$= (48 + 18\pi) \text{ ft}^2$$

$$20. \begin{array}{l} \text{Area of top} = 10 \times 6 = 60 \\ \text{Area of bottom} = 10 \times 6 = 60 \\ \text{Area of front} = 10 \times 8 = 80 \\ \text{Area of back} = 10 \times 8 = 80 \\ \text{Area of side} = 6 \times 8 = 48 \\ \text{Area of side} = 6 \times 8 = 48 \\ \text{Surface area} = 376 \text{ m}^2 \end{array}$$

## Test 5

1. (b) and (c)
2. Since there are an even number of negative factors, the product is a **positive number**.

$$3. 3000 \text{ in.} \times \frac{2.54 \text{ cm}}{1 \text{ in.}} \times \frac{1 \text{ m}}{100 \text{ cm}} = \frac{3000(2.54)}{(100)} \text{ m}$$

$$4. 4000 \text{ in.}^2 = 4000 \text{ in.} \cdot \text{in.} \times \frac{1 \text{ ft}}{12 \text{ in.}} \times \frac{1 \text{ ft}}{12 \text{ in.}}$$

$$= \frac{4000}{(12)^2} \text{ ft}^2$$

$$5. \text{Area} = \frac{1}{2}BH = \frac{1}{2}(8)(11) = 44 \text{ yd}^2$$

$$6. r = D + 2 = (12) + 2 = 6 \text{ m}$$

$$A = \pi r^2 = \pi(6)^2 = 36\pi \text{ m}^2$$

$$7. a(b + c) = ab + ac$$

$$8. \text{(a) } \{1, 2, 3, 4, 5, \dots\}$$

$$\text{(b) } \{0, 1, 2, 3, 4, 5, \dots\}$$

$$9. -4^2 + (-4)^2 = -16 + 16 = 0$$

$$10. (-5)^2 + \sqrt[3]{8} = 25 + 2 = 27$$

$$11. def^3 = (2)(-3)(-1)^3$$

$$= (2)(-3)(-1)$$

$$= 6$$

$$12. c^2 - d^2 = (-3)^2 - (-4)^2$$

$$= 9 - 16$$

$$= -7$$

$$13. -x(-u - v) - uv$$

$$= -(-1)[-(-3) - (-2)] - (3)(-2)$$

$$= -(-1)[(-3) - (-2)] - (3)(-2)$$

$$= -(-1)(-1) - (3)(-2)$$

$$= -1 - (-6)$$

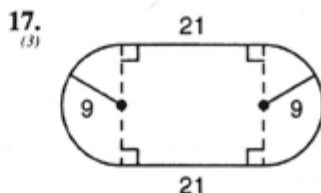
$$= 5$$

$$14. 2z + 3yz - 6z + 2yz + y - z - 4y$$

$$= -5z + 5yz - 3y$$

$$15. -4ab + 3ax + ba - 6xa = -3ab - 3ax$$

$$16. -c(3b - 7a) = -3bc + 7ac$$



$$\begin{aligned}
 P &= 21 + \frac{2\pi(9)}{2} + 21 + \frac{2\pi(9)}{2} \\
 &= 21 + 21 + \frac{18\pi}{2} + \frac{18\pi}{2} \\
 &= 42 + 9\pi + 9\pi \\
 &= (42 + 18\pi) \text{ yd}
 \end{aligned}$$

$$\begin{aligned}
 18. \text{ Area} &= \frac{1}{2}BH - \pi r^2 \\
 &= \frac{1}{2}(14)(9) - \pi(2)^2 \\
 &= (63 - 4\pi) \text{ m}^2
 \end{aligned}$$

$$\begin{aligned}
 19. \text{ Area of top} &= 8 \times 6 = 48 \\
 \text{Area of bottom} &= 8 \times 6 = 48 \\
 \text{Area of front} &= 8 \times 3 = 24 \\
 \text{Area of back} &= 8 \times 3 = 24 \\
 \text{Area of side} &= 6 \times 3 = 18 \\
 \text{Area of side} &= 6 \times 3 = 18 \\
 \text{Surface area} &= \underline{180 \text{ cm}^2}
 \end{aligned}$$

$$\begin{aligned}
 20. \text{ Volume} &= (\text{area of a base})(\text{height}) \\
 &= (54)(17) \\
 &= \underline{918 \text{ ft}^3}
 \end{aligned}$$

### Test 6

1. Since there are an even number of negative factors, the product is a **positive number**.

2. (a) Parallelogram: **a quadrilateral that has two pairs of parallel sides**

(b) Equiangular triangle: **a triangle whose angles all have equal measure**

3. (a), (c), and (e)

$$4. 20 \text{ in.} \times \frac{1 \text{ ft}}{12 \text{ in.}} \times \frac{1 \text{ mi}}{5280 \text{ ft}} = \frac{20}{(12)(5280)} \text{ mi}$$

$$\begin{aligned}
 5. 62 \text{ cm}^2 &= 62 \text{ cm} \cdot \text{cm} \times \frac{1 \text{ in.}}{2.54 \text{ cm}} \times \frac{1 \text{ in.}}{2.54 \text{ cm}} \\
 &= \frac{62}{(2.54)^2} \text{ in.}^2
 \end{aligned}$$

$$\begin{aligned}
 6. C &= \pi D \\
 \frac{(8\pi)}{\pi} &= \frac{\pi D}{\pi} \\
 D &= \underline{8 \text{ ft}}
 \end{aligned}$$

$$7. A = \frac{1}{2}BH = \frac{1}{2}(22)(14) = \underline{154 \text{ m}^2}$$

$$\begin{aligned}
 8. (-5) + 5 &= 0 \\
 0 &= 0 \quad \text{True}
 \end{aligned}$$

$$\begin{aligned}
 (5) + 5 &= 0 \\
 10 &= 0 \quad \text{False}
 \end{aligned}$$

Therefore,  $-5$  satisfies the equation  $x + 5 = 0$ .

$$9. -3x(4d - 5e - 3f) = -12dx + 15ex + 9fx$$

$$10. -7x^2yz + 3yzx^2 - zx^2y - 4y = -5x^2yz - 4y$$

$$11. m^2n^3aanm^2a^2n^4 = m^2m^2n^3nn^4aaa^2 = m^4n^8a^4$$

$$\begin{aligned}
 12. \frac{1}{4} \cdot \frac{x}{\frac{1}{4}} &= 3 \cdot \frac{1}{4} \\
 x &= \frac{3}{4}
 \end{aligned}$$

$$\begin{aligned}
 13. \frac{5x}{5} &= \frac{20}{5} \\
 x &= \underline{4}
 \end{aligned}$$

$$\begin{array}{r}
 14. x - 5 = 8 \\
 +5 \quad +5 \\
 \hline
 x = \underline{13}
 \end{array}$$

$$\begin{array}{r}
 15. x + 2\frac{2}{3} = 8\frac{5}{6} \\
 -2\frac{2}{3} \quad -2\frac{2}{3} \\
 \hline
 x = 8\frac{5}{6} - 2\frac{4}{6} \\
 x = \underline{6\frac{1}{6}}
 \end{array}$$

$$\begin{aligned}
 16. -a^2 + c(a - c) - n^2 \\
 &= -(-3)^2 + (-2)[(-3) - (-2)] - (3)^2 \\
 &= -(9) + (-2)[(-3) - (-2)] - 9 \\
 &= -9 + (-2)(-1) - 9 \\
 &= -9 + (2) - 9 \\
 &= \underline{-16}
 \end{aligned}$$

17. The three unknown lengths must have a sum of three meters since the right-hand side is three meters long.

$$P = 3 + 2 + 2 + 2 + 3 + 6 = \underline{18 \text{ m}}$$

$$\begin{aligned}
 18. \text{ Area} &= \frac{1}{2}(17)(6) + (17)(12) \\
 &= 51 + 204 \\
 &= \underline{255 \text{ mi}^2}
 \end{aligned}$$

$$19. \text{Area of a base} = \pi r^2 = \pi(3)^2 = 9\pi \text{ m}^2$$

(15)

$$\text{Perimeter of a base} = 2\pi r = 2\pi(3) = 6\pi \text{ m}$$

$$\begin{aligned} \text{Lateral surface area} &= (\text{perimeter of a base})(\text{length}) \\ &= (6\pi)(6) \\ &= 36\pi \text{ m}^2 \end{aligned}$$

Surface area

$$\begin{aligned} &= 2(\text{area of a base}) + (\text{lateral surface area}) \\ &= 2(9\pi) + (36\pi) \\ &= 18\pi + 36\pi \\ &= 54\pi \text{ m}^2 \end{aligned}$$

$$20. \text{Area of a base} = \frac{1}{2}BH = \frac{1}{2}(7)(14) = 49 \text{ cm}^2$$

(20)

$$\begin{aligned} \text{Volume} &= (\text{area of a base})(\text{height}) \\ &= (49)(8) \\ &= 392 \text{ cm}^3 \end{aligned}$$

## Test 7

1. Since there are an odd number of negative factors, the product is a **negative number**.

(13)

2. The angles opposite those sides have equal measures.

(2)

$$3. A = \frac{1}{2}BH = \frac{1}{2}(14)(9) = 63 \text{ ft}^2$$

(8)

4. (a) **Subtraction**

(9)

(b) **Multiplication**

$$5. 310 \text{ in.} \times \frac{2.54 \text{ cm}}{1 \text{ in.}} \times \frac{1 \text{ m}}{100 \text{ cm}} = \frac{310(2.54)}{(100)} \text{ m}$$

(4)

$$6. x^2z^3x^5c^5z^3x^4c^2 = x^2xx^4z^3zzz^3c^5cc^2 = x^8z^8c^8$$

(21)

$$7. 4ab + 7ba - 5 - 3ba + 9 - 2ab = 6ab + 4$$

(18)

$$8. a^2b(xa^2b + a^4b) = a^2bxa^2b + a^2ba^4b = a^4b^2x + a^6b^2$$

(27)

$$9. \frac{(WF)(36)}{36} = \frac{27}{36}$$

(28)

$$WF = \frac{3}{4}$$

$$10. f(x) = 4x - 1$$

(28)

$$f(3) = 4(3) - 1 = 12 - 1 = 11$$

$$11. 4x - 7 = 5$$

(25)

$$\begin{array}{r} +7 \quad +7 \\ \hline \frac{4x}{4} = \frac{12}{4} \\ x = 3 \end{array}$$

$$12. \frac{1}{4}x - \frac{1}{2} = 4\frac{3}{8}$$

(25)

$$\begin{array}{r} +\frac{1}{2} \quad +\frac{1}{2} \\ \hline \frac{1}{4}x = 4\frac{3}{8} + \frac{4}{8} \end{array}$$

$$\frac{1}{4}x = 4\frac{7}{8}$$

$$4 \cdot \frac{1}{4}x = \frac{39}{8} \cdot 4$$

$$x = \frac{39}{2}$$

$$13. -2a + 8 + a - 3 = 2 - 2a - a + 3$$

(26)

$$-a + 5 = -3a + 5$$

$$\frac{+3a - 5}{2} = \frac{+3a - 5}{2}$$

$$\frac{2a}{2} = \frac{0}{2}$$

$$a = 0$$

$$14. 0.04x - 0.3 = 3.3$$

(27)

$$4x - 30 = 330$$

$$\frac{+30}{4} = \frac{+30}{4}$$

$$\frac{4x}{4} = \frac{360}{4}$$

$$x = 90$$

$$15. y^3z(y+z) = (-2)^3(2)[(-2) + (2)]$$

(19)

$$= (-8)(2)[(-2) + (2)]$$

$$= (-8)(2)(0)$$

$$= 0$$

$$16. -4^2 - (-2)^3 - (-2)^2 + \sqrt[3]{27} - \sqrt[4]{16}$$

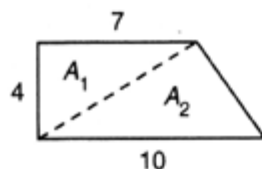
(19)

$$= -16 - (-8) - (4) + 3 - 2 = -11$$

17. The sum of the lengths of the upper horizontal segments (including the six-inch segment) must be fourteen inches since the lower horizontal segment is fourteen inches long. The sum of the lengths of the left-hand side segments (including the six-inch segment) must be eleven inches since the right-hand side segment is eleven inches long.

(3)

$$P = 11 + 14 + 11 + 14 = 50 \text{ in.}$$

18.  
(8)

$$\begin{aligned}\text{Area} &= A_1 + A_2 \\ &= \frac{1}{2}(7)(4) + \frac{1}{2}(10)(4) \\ &= 14 + 20 \\ &= 34 \text{ m}^2\end{aligned}$$

$$\begin{aligned}19. \quad MP &= 2\frac{1}{3} + 3\frac{1}{4} + 3\frac{1}{2} = 2\frac{4}{12} + 3\frac{3}{12} + 3\frac{6}{12} \\ &= 8\frac{13}{12} = 9\frac{1}{12} \text{ ft}\end{aligned}$$

$$\begin{aligned}20. \quad \text{Area of a base} &= \frac{1}{2}(12)(9) = 54 \text{ cm}^2 \\ \text{Perimeter of a base} &= 9 + 15 + 12 = 36 \text{ cm} \\ \text{Lateral surface area} &= (\text{perimeter of a base})(\text{height}) \\ &= (36)(8) \\ &= 288 \text{ cm}^2 \\ \text{Surface area} \\ &= 2(\text{area of a base}) + (\text{lateral surface area}) \\ &= 2(54) + (288) \\ &= 108 + 288 \\ &= 396 \text{ cm}^2\end{aligned}$$

## Test 8

1. 180°  
(2)

2. (a) 3(-N) - 7  
(30)

(b) 4(5N + 3)

$$\begin{aligned}3. \quad \frac{(WF)(45)}{45} &= \frac{20}{45} \\ WF &= \frac{4}{9}\end{aligned}$$

$$\begin{aligned}4. \quad \frac{(0.25)(WN)}{0.25} &= \frac{40}{0.25} \\ WN &= 160\end{aligned}$$

$$\begin{aligned}5. \quad 92 \text{ km} \times \frac{1000 \text{ m}}{1 \text{ km}} \times \frac{100 \text{ cm}}{1 \text{ m}} \times \frac{1 \text{ in.}}{2.54 \text{ cm}} \\ &= \frac{92(1000)(100)}{(2.54)} \text{ in.}\end{aligned}$$

6. P = 4s  
(3,8)

$$\begin{aligned}\frac{(48)}{4} &= \frac{4s}{4} \\ s &= 12 \text{ in.}\end{aligned}$$

$$A = s^2 = (12)^2 = 144 \text{ in.}^2$$

$$\begin{aligned}7. \quad 2N - 20 &= 50 \\ &+20 \quad +20 \\ \hline 2N &= 70 \\ N &= 35\end{aligned}$$

8. (a) 5<sup>-2</sup> =  $\frac{1}{5^2} = \frac{1}{25}$   
(29)

(b)  $\frac{1}{5^{-2}} = 5^2 = 25$

(c) 5<sup>0</sup> = 1

$$\begin{aligned}9. \quad f(x) &= -2x - 5 \\ f(-4) &= -2(-4) - 5 = 8 - 5 = 3\end{aligned}$$

$$\begin{aligned}10. \quad 0.03 + 0.035x &= 2.48 \\ 30 + 35x &= 2480 \\ \hline -30 \quad -30 \\ 35x &= 2450 \\ x &= 70\end{aligned}$$

$$\begin{aligned}11. \quad 2\frac{1}{4}x + \frac{1}{8} + \frac{7}{8}x &= \frac{1}{16} \\ \frac{25}{8}x + \frac{1}{8} &= \frac{1}{16} \\ \hline -\frac{1}{8} \quad -\frac{1}{8} \\ \frac{25}{8}x &= \frac{1}{16} - \frac{2}{16} \\ \frac{8}{25} \cdot \frac{25}{8}x &= -\frac{1}{16} \cdot \frac{8}{25} \\ x &= -\frac{1}{50}\end{aligned}$$

$$\begin{aligned}12. \quad -(x - 3) - 4(x - 1) &= 14 \\ -x + 3 - 4x + 4 &= 14 \\ -5x + 7 &= 14 \\ \hline -7 \quad -7 \\ -5x &= 7 \\ x &= -\frac{7}{5}\end{aligned}$$

$$\begin{aligned}13. \quad ab^{-3}z^2 - 4z^2b^{-3}a + 3b^{-3}z^2a + b^{-3}z^2a \\ &= ab^{-3}z^2\end{aligned}$$

$$14. \quad (b^2 - 3b^3a^{-1})3n^0b^{-2} = (b^2 - 3b^3a^{-1})3b^{-2}$$

$$\stackrel{(29)}{=} 3b^{-2}b^2 - 3b^{-2} \cdot 3b^3a^{-1} = 3 - 9a^{-1}b$$

$$15. \quad m(m - n^0)(-2n - m)$$

$$\stackrel{(29)}{=} (-2)[(-2) - (-3)^0][(-2)(-3) - (-2)]$$

$$= (-2)(-2 - 1)[-2(-3) - (-2)]$$

$$= (-2)(-3)[6 - (-2)]$$

$$= (-2)(-3)(8)$$

$$= 48$$

$$16. \quad (-4x - y^2)(-y - x)(2y)$$

$$\stackrel{(19)}{=} [-4(-3) - (-2)^2][(-2) - (-3)][2(-2)]$$

$$= [-4(-3) - 4][(-2) - (-3)][2(-2)]$$

$$= (12 - 4)(2 + 3)(-4)$$

$$= (8)(5)(-4)$$

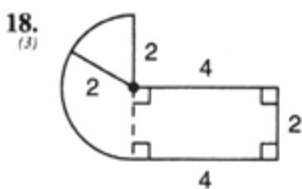
$$= -160$$

$$17. \quad -4^2 + (-4)^2 - 4^0 - |-4 - 4|$$

$$\stackrel{(29)}{=} -16 + (16) - 1 - |-4 - 4|$$

$$= -16 + (16) - 1 - |-8|$$

$$= -16 + 16 - 1 - 8 = -9$$



$$P = \frac{2\pi(2)}{2} + 2 + 4 + 2 + 4$$

$$= \frac{4\pi}{2} + 12$$

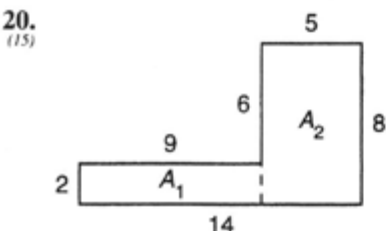
$$= (12 + 2\pi) \text{ m}$$

19. Area of a base  $= \pi r^2 = \pi(6)^2 = 36\pi \text{ yd}^2$

Volume = (area of a base)(length)

$$= (36\pi)(10)$$

$$= 360\pi \text{ yd}^3$$



$$\text{Area of a base} = A_1 + A_2$$

$$= (9)(2) + (5)(8)$$

$$= 18 + 40$$

$$= 58 \text{ cm}^2$$

$$\text{Perimeter of a base} = 2 + 9 + 6 + 5 + 8 + 14$$

$$= 44 \text{ cm}$$

$$\text{Lateral surface area} = (\text{perimeter of a base})(\text{height})$$

$$= (44)(10)$$

$$= 440 \text{ cm}^2$$

$$\text{Surface area}$$

$$= 2(\text{area of a base}) + (\text{lateral surface area})$$

$$= 2(58) + (440)$$

$$= 116 + 440$$

$$= 556 \text{ cm}^2$$

## Test 9

## 1. Commutative property for multiplication

2.  $\stackrel{(10)}{}$  (a)  $r = D + 2 = (10) + 2 = 5 \text{ yd}$

$$A = \pi r^2 = \pi(5)^2 = 25\pi \text{ yd}^2$$

(b)  $C = \pi D = \pi(10) = 10\pi \text{ yd}$

3.  $\stackrel{(4)}{}$   $1520 \text{ m} \times \frac{100 \text{ cm}}{1 \text{ m}} \times \frac{1 \text{ in.}}{2.54 \text{ cm}} \times \frac{1 \text{ ft}}{12 \text{ in.}}$

$$= \frac{1520(100)}{(2.54)(12)} \text{ ft}$$

4.  $\stackrel{(33)}{}$   $N = 2(-N) + 27$

$$N = -2N + 27$$

$$\frac{+2N \quad +2N}{3N = 27}$$

$$N = 9$$

5.  $\stackrel{(33)}{}$   $\frac{420}{2} = 210 \quad \frac{210}{2} = 105 \quad \frac{105}{3} = 35 \quad \frac{35}{5} = 7$

$$420 = 2 \cdot 2 \cdot 3 \cdot 5 \cdot 7$$

6.  $\stackrel{(28)}{}$   $\left(\frac{2}{3}\right)(WN) = 13$

$$\frac{3}{8} \cdot \frac{8}{3}WN = 13 \cdot \frac{3}{8}$$

$$WN = \frac{39}{8}$$

7.  $\stackrel{(28)}{}$   $f(x) = -5 - 7x$

$$f(-2) = -5 - 7(-2) = -5 - (-14) = 9$$

8.  $\stackrel{(36)}{}$  (a)  $-3^{-2} = -\frac{1}{3^2} = -\frac{1}{9}$

(b)  $\frac{1}{-3^{-2}} = \frac{3^2}{-1} = \frac{9}{-1} = -9$

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