

Algebra 1

An Incremental Development
THIRD EDITION

SAXON

Contents

<i>Preface</i>	<i>xi</i>
<i>Lesson 1</i> Addition and Subtraction of Fractions • Lines and Segments	1
<i>Lesson 2</i> Angles • Polygons • Triangles • Quadrilaterals	4
<i>Lesson 3</i> Perimeter • Circumference	10
<i>Lesson 4</i> Review of Arithmetic	14
<i>Lesson 5</i> Sets • Absolute Value • Addition of Signed Numbers	23
<i>Lesson 6</i> Rules for Addition • Adding More Than Two Numbers • Inserting Parentheses Mentally • Definition of Subtraction	29
<i>Lesson 7</i> The Opposite of a Number • Simplifying More Difficult Notations	34
<i>Lesson 8</i> Area	36
<i>Lesson 9</i> Rules for Multiplication of Signed Numbers • Inverse Operations • Rules for Division of Signed Numbers • Summary	43
<i>Lesson 10</i> Division by Zero • Exchange of Factors in Multiplication • Conversions of Area	47
<i>Lesson 11</i> Reciprocal and Multiplicative Inverse • Order of Operations • Identifying Multiplication and Addition	51
<i>Lesson 12</i> Symbols of Inclusion • Order of Operations	54
<i>Lesson 13</i> Multiple Symbols of Inclusion • More on Order of Operations • Products of Signed Numbers	57
<i>Lesson 14</i> Evaluation of Algebraic Expressions	63
<i>Lesson 15</i> Surface Area	67
<i>Lesson 16</i> More Complicated Evaluations	72
<i>Lesson 17</i> Factors and Coefficients • Terms • The Distributive Property	74
<i>Lesson 18</i> Like Terms • Addition of Like Terms	79
<i>Lesson 19</i> Exponents • Powers of Negative Numbers • Roots • Evaluation of Powers	82
<i>Lesson 20</i> Volume	86

<i>Lesson 21</i>	Product Rule for Exponents • Addition of Like Terms with Exponents	91
<i>Lesson 22</i>	Review of Numerical and Algebraic Expressions • Statements and Sentences • Conditional Equations	95
<i>Lesson 23</i>	Equivalent Equations • Additive Property of Equality	99
<i>Lesson 24</i>	Multiplicative Property of Equality	102
<i>Lesson 25</i>	Solution of Equations	106
<i>Lesson 26</i>	More Complicated Equations	110
<i>Lesson 27</i>	More on the Distributive Property • Simplifying Decimal Equations	113
<i>Lesson 28</i>	Fractional Parts of Numbers • Functional Notation	116
<i>Lesson 29</i>	Negative Exponents • Zero Exponents	121
<i>Lesson 30</i>	Algebraic Phrases • Decimal Parts of a Number	125
<i>Lesson 31</i>	Equations with Parentheses	128
<i>Lesson 32</i>	Word Problems	131
<i>Lesson 33</i>	Products of Prime Factors • Statements About Unequal Quantities	134
<i>Lesson 34</i>	Greatest Common Factor	138
<i>Lesson 35</i>	Factoring the Greatest Common Factor • Canceling	140
<i>Lesson 36</i>	Distributive Property of Rational Expressions that Contain Positive Exponents • Minus Signs and Negative Exponents	146
<i>Lesson 37</i>	Inequalities • Greater Than and Less Than • Graphical Solutions of Inequalities	149
<i>Lesson 38</i>	Ratio Problems	153
<i>Lesson 39</i>	Trichotomy Axiom • Negated Inequalities • Advanced Ratio Problems	156
<i>Lesson 40</i>	Quotient Rule for Exponents • Distributive Property of Rational Expressions that Contain Negative Exponents	160
<i>Lesson 41</i>	Addition of Like Terms in Rational Expressions • Two-Step Problems	165
<i>Lesson 42</i>	Solving Multivariable Equations	168
<i>Lesson 43</i>	Least Common Multiple • Least Common Multiples of Algebraic Expressions	171
<i>Lesson 44</i>	Addition of Rational Expressions with Equal Denominators • Addition of Rational Expressions with Unequal Denominators	176
<i>Lesson 45</i>	Range, Median, Mode, and Mean	181
<i>Lesson 46</i>	Conjunctions	185
<i>Lesson 47</i>	Percents Less Than 100 • Percents Greater Than 100	187
<i>Lesson 48</i>	Polynomials • Degree • Addition of Polynomials	192
<i>Lesson 49</i>	Multiplication of Polynomials	197
<i>Lesson 50</i>	Polynomial Equations • Ordered Pairs • Cartesian Coordinate System	200

<i>Lesson 51</i>	Graphs of Linear Equations • Graphs of Vertical and Horizontal Lines	205
<i>Lesson 52</i>	More on Addition of Rational Expressions with Unequal Denominators • Overall Average	211
<i>Lesson 53</i>	Power Rule for Exponents • Conversions of Volume	215
<i>Lesson 54</i>	Substitution Axiom • Simultaneous Equations • Solving Simultaneous Equations by Substitution	218
<i>Lesson 55</i>	Complex Fractions • Division Rule for Complex Fractions	224
<i>Lesson 56</i>	Finite and Infinite Sets • Membership in a Set • Rearranging Before Graphing	228
<i>Lesson 57</i>	Addition of Algebraic Expressions with Negative Exponents	232
<i>Lesson 58</i>	Percent Word Problems	235
<i>Lesson 59</i>	Rearranging Before Substitution	239
<i>Lesson 60</i>	Geometric Solids • Prisms and Cylinders	242
<i>Lesson 61</i>	Subsets • Subsets of the Set of Real Numbers	247
<i>Lesson 62</i>	Square Roots • Higher Order Roots • Evaluating Using Plus or Minus	252
<i>Lesson 63</i>	Product of Square Roots Rule • Repeating Decimals	257
<i>Lesson 64</i>	Domain • Additive Property of Inequality	260
<i>Lesson 65</i>	Addition of Radical Expressions • Weighted Average	264
<i>Lesson 66</i>	Simplification of Radical Expressions • Square Roots of Large Numbers	268
<i>Lesson 67</i>	Review of Equivalent Equations • Elimination	271
<i>Lesson 68</i>	More About Complex Fractions	276
<i>Lesson 69</i>	Factoring Trinomials	280
<i>Lesson 70</i>	Probability • Designated Order	284
<i>Lesson 71</i>	Trinomials with Common Factors • Subscripted Variables	288
<i>Lesson 72</i>	Factors That Are Sums • Pyramids and Cones	292
<i>Lesson 73</i>	Factoring the Difference of Two Squares • Probability Without Replacement	298
<i>Lesson 74</i>	Scientific Notation	301
<i>Lesson 75</i>	Writing the Equation of a Line • Slope-Intercept Method of Graphing	305
<i>Lesson 76</i>	Consecutive Integers	313
<i>Lesson 77</i>	Consecutive Odd and Consecutive Even Integers • Fraction and Decimal Word Problems	316
<i>Lesson 78</i>	Rational Equations	320
<i>Lesson 79</i>	Systems of Equations with Subscripted Variables	323
<i>Lesson 80</i>	Operations with Scientific Notation	326

<i>Lesson 81</i>	Graphical Solutions • Inconsistent Equations • Dependent Equations	330
<i>Lesson 82</i>	Evaluating Functions • Domain and Range	337
<i>Lesson 83</i>	Coin Problems	342
<i>Lesson 84</i>	Multiplication of Radicals • Functions	345
<i>Lesson 85</i>	Stem-and-Leaf Plots • Histograms	351
<i>Lesson 86</i>	Division of Polynomials	357
<i>Lesson 87</i>	More on Systems of Equations • Tests for Functions	362
<i>Lesson 88</i>	Quadratic Equations • Solution of Quadratic Equations by Factoring	367
<i>Lesson 89</i>	Value Problems	371
<i>Lesson 90</i>	Word Problems with Two Statements of Equality	374
<i>Lesson 91</i>	Multiplicative Property of Inequality • Spheres	378
<i>Lesson 92</i>	Uniform Motion Problems About Equal Distances	383
<i>Lesson 93</i>	Products of Rational Expressions • Quotients of Rational Expressions	388
<i>Lesson 94</i>	Uniform Motion Problems of the Form $D_1 + D_2 = N$	391
<i>Lesson 95</i>	Graphs of Non-Linear Functions • Recognizing Shapes of Various Non-Linear Functions	395
<i>Lesson 96</i>	Difference of Two Squares Theorem	402
<i>Lesson 97</i>	Angles and Triangles • Pythagorean Theorem • Pythagorean Triples	405
<i>Lesson 98</i>	Distance Between Two Points • Slope Formula	412
<i>Lesson 99</i>	Uniform Motion—Unequal Distances	418
<i>Lesson 100</i>	Place Value • Rounding Numbers	422
<i>Lesson 101</i>	Factorable Denominators	427
<i>Lesson 102</i>	Absolute Value Inequalities	430
<i>Lesson 103</i>	More on Rational Equations	435
<i>Lesson 104</i>	Abstract Rational Equations	439
<i>Lesson 105</i>	Factoring by Grouping	443
<i>Lesson 106</i>	Linear Equations • Equation of a Line Through Two Points	446
<i>Lesson 107</i>	Line Parallel to a Given Line • Equation of a Line with a Given Slope	450
<i>Lesson 108</i>	Square Roots Revisited • Radical Equations	454
<i>Lesson 109</i>	Advanced Trinomial Factoring	458
<i>Lesson 110</i>	Vertical Shifts • Horizontal Shifts • Reflection About the x Axis • Combinations of Shifts and Reflections	462
<i>Lesson 111</i>	More on Conjunctions • Disjunctions	468
<i>Lesson 112</i>	More on Multiplication of Radical Expressions	471
<i>Lesson 113</i>	Direct Variation • Inverse Variation	473

<i>Lesson 114</i>	Exponential Key • Exponential Growth • Using the Graphing Calculator to Graph Exponential Functions	479
<i>Lesson 115</i>	Linear Inequalities	485
<i>Lesson 116</i>	Quotient Rule for Square Roots	490
<i>Lesson 117</i>	Direct and Inverse Variation Squared	493
<i>Lesson 118</i>	Completing the Square	496
<i>Lesson 119</i>	The Quadratic Formula • Use of the Quadratic Formula	501
<i>Lesson 120</i>	Box-and-Whisker Plots	505
<i>Appendix A</i>	Properties of the Set of Real Numbers	511
<i>Appendix B</i>	Glossary	515
	Answers	523
	Index	557

10.C**conversions
of area**

In this section we will use unit multipliers to convert area measurements.

example 10.5 Use two unit multipliers to convert 44 square inches to square centimeters.

solution We will write 44 in.^2 as $44 \text{ in.} \cdot \text{in.}$. Therefore, we have

$$44 \cancel{\text{in.}} \cdot \cancel{\text{in.}} \times \frac{2.54 \text{ cm}}{1 \cancel{\text{in.}}} \times \frac{2.54 \text{ cm}}{1 \cancel{\text{in.}}} = 44(2.54)(2.54) \text{ cm}^2$$

example 10.6 Use four unit multipliers to convert 125 square centimeters to square feet.

solution We will write 125 cm^2 as $125 \text{ cm} \cdot \text{cm}$. Therefore, we have

$$125 \cancel{\text{cm}} \cdot \cancel{\text{cm}} \times \frac{1 \cancel{\text{in.}}}{2.54 \cancel{\text{cm}}} \times \frac{1 \cancel{\text{in.}}}{2.54 \cancel{\text{cm}}} \times \frac{1 \text{ ft}}{12 \cancel{\text{in.}}} \times \frac{1 \text{ ft}}{12 \cancel{\text{in.}}} = \frac{125}{(2.54)(2.54)(12)(12)} \text{ ft}^2$$

practice Simplify:

a. $\frac{-3 - 2}{-2 + 8 - 6}$

b. $\frac{-8 + 6 + 2}{8 - 4 - 4}$

c. $-(-4)(-1)(-4)$

d. $2(-6)(10)(-2)$

e. Use two unit multipliers to convert 44 square miles to square feet.

f. Use two unit multipliers to convert 3500 square centimeters to square meters.

**problem set
10**

1. What property of multiplication states that the order in which two real numbers are multiplied does not affect the product?

2. (a) What operation is the inverse operation of addition?

(b) What operation is the inverse operation of subtraction?

(c) What operation is the inverse operation of multiplication?

(d) What operation is the inverse operation of division?

3. (a) What is the additive inverse of $\frac{1}{3}$?

(b) What is the additive inverse of $-\frac{1}{3}$?

(c) What is the sum of a real number and its additive inverse?

4. What is another name for the additive inverse of a number?

Simplify:

5. $-2(3)(4)$

6. $-4(3)(-2)$

7. $4(-3)(-4)$

8. $\frac{-2 + 3}{4 - 5 + 3}$

9. $\frac{4 + 7 - 6}{2 + 7 - 3}$

10. $\frac{-3 + 6 - 1}{-2 + 4 - 2}$

11. Use one unit multiplier to convert 50 inches to centimeters.