

KEY TO THE MODEL ALGEBRA

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Key to the Model Algebra by Edward Gideon

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EDWARD GIDEON

**KEY TO THE
MODEL ALGEBRA**

° KEY

TO THE

MODEL ALGEBRA

BY

EDWARD GIDEON

SUPERVISING PRINCIPAL OF GEORGE G. MEADE SCHOOL, PHILADELPHIA



PHILADELPHIA

ELDREDGE & BROTHER

1904

*Hinds, Noble, & Eldredge
1425 Arch St.*

KEY TO MODEL ALGEBRA

FOR

ELEMENTARY SCHOOLS.



1. 18 apples. 2. 8. 3. 5 books, Mary; 20 books, Anna. 4. 12 dollars. 5. 12 dollars, B; 84 dollars, A. 6. 12. 7. 4 fish, Henry; 32 fish, William. 8. 24. 9. \$40, carriage; \$120, horse. 10. 9. 11. 17 miles. 12. 2 years, Ida; 16 years, Emma. 13. 12 marbles. 14. 20 pigeons. 15. 20 rabbits, Frank; 4 rabbits, George. 16. 12 oranges, Martha; 3 oranges, Anna. 17. 18 years, John; 12 years, Mary. 18. 50 cents. 19. 25 fish, James; 10 fish, Thomas. 20. 36 years, B; 27 years, A. 21. \$80, horse; \$60, carriage. 22. 36, 8. 23. 24 quarts, George; 9 quarts, Anna. 24. \$6, sheep; \$21, cow. 25. 8 cents, first; 16 cents, second; 32 cents, third. 26. 6, first; 24, second; 30, third. 27. 14 years, Ida; 8 years, Emma. 28. 80 sheep, Mr. Brown; 50 sheep, Mr. Jones. 29. 4 oranges, Minnie; 12 oranges, Harry; 8 oranges, Frank. 30. 40 marbles. 31. 12 oranges. 32. 80 cents.

33. Let x = the number,

$$\text{Then } x + \left(\frac{1}{2}x - \frac{1}{3}x\right) = 42$$

$$x + \frac{1}{6}x = 42$$

$$\frac{7}{6}x = 42$$

$$\frac{1}{6}x = 6$$

$$\frac{7}{6}x \text{ or } x = 42$$

Therefore, the number is 42.

34. 15 years. 35. 60 cents. 36. 16 feet, longer; 11 feet, shorter. 37. 18. 38. \$40, cart; \$80, pony. 39. 4, 10. 40. 45 pigeons. 41. 18. 42. 80 cents. 43. \$40. 44. \$10.

45. Let x = Kate's age,

$$\text{Then } \frac{x+12}{x-12} = 20 \text{ years.}$$

$$x = 20 - 12$$

$$x = 8$$

Therefore, Kate is 8 years old.

(See explanation, Illustrative Problem 29.)

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46. 12 marbles. 47. 10 rabbits, Harry; 15 rabbits, Frank. 48. \$50, carriage; \$70, horse. 49. 20 cents, Alice; 30 cents, Lucy. 50. 17 miles.

$$\begin{aligned} 51. \text{ Let } & x = \text{father's age,} \\ \text{And } & \frac{1}{2}x = \text{Henry's age,} \\ \text{Then } & x + \frac{1}{2}x = 60 \text{ yrs.} - 10 \text{ yrs.} \\ & \frac{3}{2}x = 50 \\ & \frac{1}{2}x = 10 \\ & \frac{1}{2}x \text{ or } x = 40 \end{aligned}$$

Therefore, Henry is 10 years old, and his father is 40 years old.

52. 11. 53. 5 quarts, William; 13 quarts, John. 54. 30 feet.

$$\begin{aligned} 55. \text{ Let } & x = \text{Walter's number of quarts,} \\ \text{And } & x - 6 = \text{Edgar's number,} \\ \text{Then } & x + x - 6 = 30 \text{ quarts.} \\ & \frac{x + x - 30 + 6}{2x - 36} \\ & 2x = 36 \\ & x = 18 \\ & x - 6 = 12 \end{aligned}$$

Therefore, Walter sold 18 quarts, and Edgar sold 12 quarts.

(See explanation, Illustrative Problem 30.)

56. 10. 57. 14 oranges, Ida; 10 oranges, Emma. 58. 12 rabbits, Frank; 8 rabbits, Emma. 59. \$100. 60. 54 cents. 61. 14 years. 62. \$60, watch; \$15, chain. 63. 15 sheep. 64. 12. 65. 15 years. 66. 16 marbles. 67. 12 cents, lemons; 24 cents, oranges.

$$\begin{aligned} 68. \text{ Let } & x = \text{Anna's,} \\ \text{And } & \frac{1}{2}x = \text{Martha's,} \\ \text{And } & \frac{1}{2}x - 10 = \text{Nellie's,} \\ \text{Then } & x + \frac{1}{2}x + \frac{1}{2}x - 10 = 42 \text{ cents.} \\ & \frac{3}{2}x = 52 \\ & \frac{1}{2}x = 4 \\ & \frac{1}{2}x \text{ or } x = 24 \\ & \frac{1}{2}x = 16 \\ & \frac{1}{2}x - 10 = 2 \end{aligned}$$

Therefore, Anna has 24 cents, Martha, 16 cents, and Nellie, 2 cents.

69. 12, 2; 24.

$$\begin{aligned} 70. \text{ Let } & x = \text{number John bought,} \\ \text{And } & \frac{1}{2}x = \text{number Thomas bought,} \\ \text{Then } & 2x + \frac{1}{2}x = 77 \text{ cents.} \\ & \frac{5}{2}x = 77 \end{aligned}$$

$$\frac{1}{2}x - 11$$

$$\frac{3}{4}x \text{ or } x - 22$$

Therefore, John bought 22 apples, and Thomas, 11 apples.

71. 15 oranges. 72. 15. 73. 360 yards. 74. 24 feet. 75. 8 inches.
76. 8 inches long, 6 inches wide.

77. Let x = amount in bank,

Then x = amount earned,

And 20% of $(x+x) = \frac{1}{5}x$;

Or, $\frac{3}{4}x + 25$ = amount spent,

Hence, $x+x - \frac{1}{5}x - 25 = 55$ cents.

$$1\frac{4}{5}x = 80$$

$$\frac{1}{5}x = 10$$

$$\frac{3}{4}x \text{ or } x = 50$$

Therefore, Harry had 50 cents in his bank.

78. 12. 79. 8 pigeons, George; 12 pigeons, William. 80. 12 years.
81. \$1.20. 82. 24 cents, Frank; 18 cents, Fanny. 83. 25 cents.
84. \$10, father; \$5, Frank; \$4, Harry. 85. 25 years, mother; 5 years,
child; 30 years, father. 86. 32 girls, 24 boys.

87. Let x = B's money,

Then $\frac{3}{4}x$ = A's money,

And $x + \frac{3}{4}x = 75$ cents.

$$\frac{7}{4}x = 75$$

$$\frac{1}{4}x = 15$$

$$\frac{3}{4}x \text{ or } x = 45$$

$$\frac{1}{4}x = 30$$

Therefore, A has 30 cents, and B has 45 cents.

88. \$15, Henry; \$10, George. 89. \$18, A paid; \$12, B paid. 90. \$48,
cost; \$2, gain. 91. \$25, cost; \$20, selling price at 20% loss.

92. Let x = principal,

Then $\frac{1}{10}x$ = interest,

And $x + \frac{1}{10}x = \$210$

$$\frac{11}{10}x = 210$$

$$\frac{1}{10}x = 10$$

$$\frac{11}{10}x \text{ or } x = 200$$

Therefore, the principal is \$200.

93. \$50. 94. 36 marbles, Horace; 24 marbles, Herbert. 95. 30
papers, first boy; 20 papers, second boy.

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96. Let $x = C$'s,
 Then $\frac{2}{3}x = B$'s,
 And $\frac{1}{3}x = A$'s.
 $\frac{2}{3}x = C$'s,
 $\frac{1}{3}x = A$'s.
 Therefore, A 's = $\frac{1}{3}$ of C 's, or
 $\frac{1}{3}$ of C 's = A 's.

97. Let $x =$ number of dimes,
 And $2x =$ number of nickels,
 Then $10x =$ value of dimes,
 And $(2x \times 5)$, or $10x =$ value of nickels.
 Hence, $\frac{10x + 10x = 100.}{20x = 100}$
 $x = 5$
 $2x = 10$

Therefore, you would give 5 dimes and 10 nickels.

98. $\frac{1}{2}$ of Frank's age = John's age. (See solution of Problem 96.) 99. 40 cents, first boy; 20 cents, second boy; 80 cents, third boy. 100. 6 feet, pole; 18 feet, line.

Algebraic Expression.—Page 27.

- | | | |
|------------------------------|----------------------------------|------------------------------------|
| 1. $2ab^3$. | 10. $a + 3b + c^2$. | 18. $\frac{a^2x + 3y^2}{5}$. |
| 2. $\frac{x^2}{4}$. | 11. $\frac{bc}{3} - x^2$. | 19. $4b^2c - \frac{y^2}{2}$. |
| 3. $2a + b$. | 12. $4b^2c + \frac{a^2}{4}$. | 20. $2a + 3b + 4$. |
| 4. $c^2 - 4d^2$. | 13. $\frac{b^3}{4} - 5c^2x^2$. | 21. $3b^2 + 5 - \frac{2}{a}$. |
| 5. $a + 3bc^2$. | 14. $4x^2 + \frac{x^2}{2}$. | 22. $c^2 - 4d^2 + \frac{ax}{5}$. |
| 6. $3bc - d^2$. | 15. $2a + b - 3$. | 23. $4b^2c^2 - \frac{2a}{b}$. |
| 7. $4c^2d + \frac{b}{3}$. | 16. $3b - \frac{1}{2}cd + x^2$. | 24. $5a^2x^2 + 4 - \frac{1}{2}y$. |
| 8. $4c^3 + x^2y$. | 17. $5s - \frac{y^2}{4}$. | |
| 9. $\frac{a^2}{2} - 2a^2b$. | | |

Page 29.

1. $a + b$. 2. $b + c$. 3. a cents + c cents. 4. b cents + d cents.
 5. $a - b$. 6. $b - c$; b cents - c cents. 7. a dollars - c dollars. 8. x
 marbles - y marbles, or $x - y$ is the difference in number. 9. $a + a$, or
 $2a$; $a + a + a$, or $3a$. 10. $3b$; $5b$. 11. $3c$; $4c$. 12. $d + 3d$,
 or $4d$. 13. $3x - 2x$, or x . 14. $3y$ cents. 15. $\frac{a}{3}$ 16. $\frac{c \text{ cents}}{5}$.
 17. $\frac{x \text{ cents}}{12}$ 18. $4 - a$. 19. $\frac{b}{3}$ 20. $\frac{c}{3}$; $\frac{2c}{3}$

$$a=4, b=5, c=10.$$

21. $5a$; 20. 22. $5a, 20; 4a, 16.$ 23. $7b, 35; 3b, 15.$ 24. $9bc, 450.$

$$a=5, b=7, c=12.$$

25. $2a, 10; 4a, 20; 3a, 15.$ 26. $4b, 28; 5b, 35.$ 27. $7b, 49.$
28. $5c, 60; 7c, 84.$ 29. $2ac, 120.$

$$a=3, b=5, c=7.$$

30. $2a, 6; 3a^2, 27.$ 31. $5b, 25.$ 32. $3b, 15; ab, 15; b^3c^3, 8575.$
33. $8c, 56; 15b, 75.$ 34. $12ac, 252.$

$$a=6, b=8, c=10.$$

35. $\frac{a}{2}, 3.$ 36. $12c+6-2c-20; 15a+5a-3.$ 37. $\frac{2a}{3}-4; \frac{16}{b}-2.$
38. $12ac+3a-4c=40.$

39. $a+b, 8$ cents. 40. $b+c, 14$ cans. 41. $a+b+c, 18$ miles.
42. $a+b, 18$ cents. 43. $a+b+c, 20$ yd.

44. $a-b, 7$ years. 45. $b-c, 5$ cents. 46. $a-b-c, 6$ tons. 47. $b-c-d, 10$ gal.
48. $c-d-e, 3.$ 49. ab cents, 45 cts. 50. bc yards, 60 yd. 51. ab cents + cb cents, 60 cts. 52. ab cents + b cents, 60 cts.
53. ab miles - bc miles, 5 miles.

54. $a+b$, or $\frac{a}{b}$ boys, 4 boys. 55. $\frac{a}{b}, 5; \frac{a}{c}, 2.$ 56. $(a+b)c$, or $\frac{ac}{b}$, \$14.
57. $a+bc$, or $\frac{a}{bc}, 2.$ 58. $\frac{ab}{c}$ miles, 12 miles.

$$a=4, b=8, c=12.$$

59. $a+b, 12$ cents. 60. $c+5, 17$ oranges. 61. $c+b+c+b$, or $2c+2b, 40$ inches.
62. $c-a, 8$ cents. 63. $2b-3, 13$ inches. 64. $c-a, 8$ feet. 65. $3a \times a$, or $3ac, 144.$ 66. $b \times 10$, or $10b, 80$ cents. 67. $4a+3c, 52$ cents.
68. $\frac{12}{a}$, or $12 \div a, 3$ apples. 69. $5b+4$, or $\frac{5b}{4}, 10$ pounds.
70. $4c+a$, or $\frac{4c}{a}, 12$ hats. 71. $32+b$, or $\frac{32}{b}, 4$ cents.

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72. $c + \frac{1}{2}c$, or $\frac{3}{2}c$, \$15. 73. $5c \times \frac{1}{10}$, or $\frac{c}{2}$, \$3; $5c \times \frac{1}{10}$, or $\frac{c}{2}$, \$6; $5c \times \frac{1}{10}$, or $\frac{c}{2}$, \$10.50.

$$a=10, b=12, c=20, x=50.$$

74. $\frac{a}{5}$, 2. 75. $b \times 2$, or $2b$, 24. 76. $\frac{c}{4}$, 5. 77. $\frac{1}{2}c$, 12. 78. $\frac{1}{2}b$, 16. 79. $\frac{c+10}{6}$, \$5. 80. $15b - 15a$, 30 cents. 81. $\frac{ab}{2}$, 60. 82. $x + a$, 5. 83. 10c cents + 100 cents, \$2. 84. $\frac{c}{4}, \frac{3c}{4}$; 5, 15. 85. $c - 4$, 16 yr.; $c + a$, 30 yr. 86. $c + a - b$, 18 rabbits. 87. $x - \frac{a}{2} - b$, \$33. 88. $\frac{3c}{b}$, 5 yd. 89. $\frac{c}{5}$; 4 yr., Elsie; $\frac{4c}{5}$; 16 yr., William. 90. $(b \times c) + a$, or $bc + a$, 250. 91. $\frac{x-2}{b}$, 4. 92. $abc - 500$, \$19. 93. $\frac{c}{4}$, \$5. 94. $bx - ax$, \$1. 95. $\frac{c+10}{a}$, \$3. 96. $\frac{c}{5}$, 4 years. 97. $\frac{x}{5}, \frac{4x}{5}$; 10 marbles, Thomas; 40 marbles, Henry. 98. $x - \frac{x}{2} - a$, 15 cents. 99. $\frac{bc}{2} + 6a$, 2 pounds. 100. $2c + \frac{1}{2}c$, \$44.

Positive and Negative Quantities.—Page 40.

$$a=6, b=5, c=4, x=3, y=2.$$

1. . . . 2. . . . 3. 6. 4. -3. 5. . . . 6. . . .
 7. -12. 8. 24. 9. . . . 10. 108. 11. 1500. 12. -9.
 13. -720. 14. 72. 15. -36. 16. -4860. 17. $120 + 3 - 40$.
 18. $-\frac{b^2y}{5}$; $-\frac{2}{3}$, -10.

19. 10. 20. 12. 21. 14. 22. 17. 23. -13. 24. -15.
 25. -18. 26. -22. 27. 18. 28. -25. 29. 29. 30. -34.

$$a=10, b=8, c=5, x=3, y=2.$$

31. 18. 32. 13. 33. 30. 34. 14. 35. -40. 36. -17.
 37. -22. 38. -28. 39. +14. 40. -28. 41. 15. 42. -22.

$$a=2, b=3, c=4, x=5, y=6.$$

43. -8. 44. +5. 45. 5. 46. +2. 47. 5. 48. 7. 49. +4.