For most 2-by-1 and 3-by-1 multiplication problems, we use the **addition method**, but sometimes it may be faster to use subtraction. By practicing these skills, you will be able to move on to multiplying most 2-digit numbers together. ■

Important Terms

addition method: A method for multiplying numbers by breaking the problem into sums of numbers. For example, $4 \times 17 = (4 \times 10) + (4 \times 7) = 40 + 28 = 68$, or $41 \times 17 = (40 \times 17) + (1 \times 17) = 680 + 17 = 697$.

distributive law: The rule of arithmetic that combines addition with multiplication, specifically $a \times (b + c) = (a \times b) + (a \times c)$.

factoring method: A method for multiplying numbers by factoring one of the numbers into smaller parts. For example, $35 \times 14 = 35 \times 2 \times 7 = 70 \times 7 = 490$.

Suggested Reading

Benjamin and Shermer, *Secrets of Mental Math: The Mathemagician's Guide to Lightning Calculation and Amazing Math Tricks*, chapter 2.

Julius, *More Rapid Math Tricks and Tips: 30 Days to Number Mastery.*

———, *Rapid Math Tricks and Tips: 30 Days to Number Power.*

Kelly, *Short-Cut Math.*

Problems

Because 2-by-1 and 3-by-1 multiplication problems are so important, an ample number of practice problems are provided. Calculate the following 2-by-1 multiplication problems in your head using the addition method.

1. 40×8

2. 42×8

3. 20×4

4. 28×4

5. 56×6

6. 47×5

7. 45×8

8. 26×4

9. 68×7

10. 79×9

11. 54×3

12. 73×2

13. 75×8

14. 67×6

15. 83×7

16. 74×6

17. 66×3

18. 83×9

19. 29×9

20. 46×7

Calculate the following 2-by-1 multiplication problems in your head using the addition method and the subtraction method.

21. 89×9

22. 79×7

23. 98×3

24. 97×6

25. 48×7

The following problems arise while squaring 2-digit numbers or multiplying numbers that are close together. They are essentially 2-by-1 problems with a 0 attached.

26. 20×16

27. 20×24

28. 20×25

29. 20×26

30. 20×28

31. 20×30

32. 30×28

33. 30×32

34. 40×32

35. 30×42

36. 40×48

37. 50×44

38. 60×52

39. 60×68

40. 60×69

41. 70×72

42. 70×78

43. 80×84

44. 80×87

45. 90×82

46. 90×96

Here are some more problems that arise in the first step of a 2-by-2 multiplication problem.

47. 30×23

48. 60×13

49. 50×68

50. 90×26

51. 90×47

52. 40×12

53. 80 × 41

54. 90 × 66

55. 40 × 73

Calculate the following 3-by-1 problems in your head.

56. 600 × 7

57. 402 × 2

58. 360 × 6

59. 360 × 7

60. 390 × 7

61. 711 × 6

62. 581 × 2

63. 161 × 2

64. 616 × 7

65. 679 × 5

66. 747 × 2

67. 539 × 8

68. 143 × 4

69. 261 × 8

70. 624 × 6

71. 864 × 2

72. 772 × 6

73. 345 × 6

74. 456 × 6

75. 476 × 4

76. 572 × 9

77. 667 × 3

When squaring 3-digit numbers, the first step is to essentially do a 3-by-1 multiplication problem like the ones below.

78. 404 × 400

79. 226 × 200

80. 422 × 400

81. 110 × 200

82. 518 × 500

83. 340 × 300

84. 650 × 600

85. 270 × 200

86. 706 × 800

87. 162 × 200

88. 454×500

89. 664×700

Use the factoring method to multiply these 2-digit numbers together by turning the original problem into a 2-by-1 problem, followed by a 2-by-1 or 3-by-1 problem.

90. 43×14

91. 64×15

92. 75×16

93. 54×24

94. 89×72

In poker, there are 2,598,960 ways to be dealt 5 cards (from 52 different cards, where order is not important). Calculate the following multiplication problems that arise through counting poker hands.

95. The number of hands that are straights (40 of which are straight flushes) is

$10 \times 4^5 = 4 \times 4 \times 4 \times 4 \times 4 \times 10 = ???$

96. The number of hands that are flushes is

$(4 \times 13 \times 12 \times 11 \times 10 \times 9)/120 = 13 \times 11 \times 4 \times 9 = ???$

97. The number of hands that are four-of-a-kind is $13 \times 48 = ???$

98. The number of hands that are full houses is $13 \times 12 \times 4 \times 6 = ???$

Solutions for this lecture begin on page 97.